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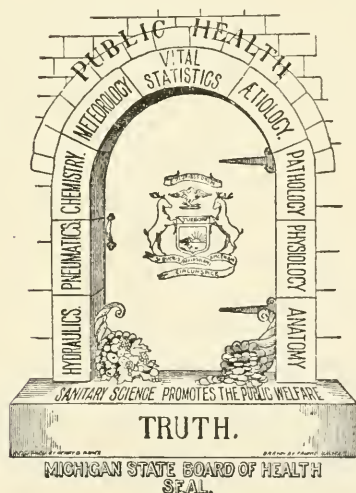
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TWENTY-SEVENTH ANNUAL REPORT
OF THE
SECRETARY
OF THE
STATE BOARD OF HEALTH
OF THE
STATE OF MICHIGAN
FOR THE
FISCAL YEAR ENDING JUNE 30, 1899.



BY AUTHORITY

LANSING, MICHIGAN
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OFFICE OF THE
SECRETARY OF THE STATE BOARD OF HEALTH, }
LANSING, MICHIGAN, *December, 1899.*

TO HON. HAZEN S. PINGREE, *Governor of Michigan:*

SIR—In compliance with the laws of this State, I present to you the accompanying report for the fiscal year ending June 30, 1899.

Very respectfully,

HENRY B. BAKER,

Secretary of the State Board of Health.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO
PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no paper shall be published in the annual report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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REPORT.

PART I.

INTRODUCTORY, GENERAL STATEMENTS.

This is the Twenty-seventh Annual Report of the Secretary of the Michigan State Board of Health, and is for the fiscal year-ending June 30, 1899. It is arranged in two parts.

The first part contains the Secretary's Report of the Work of the Board; General Report of the Work in the office of the Secretary of the Board; Abstracts from the Quarterly Reports of Work in the Office of the Secretary, and of the Condition of Health During the Fiscal Year Ending June 30, 1899; President's Annual Address; Biennial Report of the State Board of Health to the Governor and Legislature Relative to Legislation; Public Health Legislation and Proposed Legislation; Report of the Secretary Relative to Property for the Fiscal Year Ending June 30, 1899; Postage Account, and Financial Statements for the Fiscal and Calendar Years.

The second part contains abstracts and reports, including report on the "Principal Meteorological Conditions in Michigan in 1898," one on the "Time of Greatest Prevalence of Each Disease," being a "Study of the Causes of Sickness in Michigan," especially in 1898, one on the "Communicable Diseases in Michigan in 1898," Diphtheria, Scarlet Fever, Typhoid Fever, Measles, Whooping-cough, Smallpox, Chicken-pox, Consumption, Cowpox, Mumps, Pneumonia, Itch, Cancer, Erysipelas, Tuberculosis in Beef, Poisoning by Vanilla Extract, Formaldehyde Disinfection, Tyrotoxicon Poisoning, Glanders, Actinomycosis, Fatal Disease among Hogs, Rabies, Trichinosis, Hog Cholera, Injuries and Loss of Life and Property Alleged to have been Caused by the use of Kerosene in Michigan in 1898, Alleged Nuisances.

Under the law, the secretary of the Board is required to disseminate information "through an annual report and otherwise;" and by direction of the Board, he issues immediately after the close of each week, a bulletin, which shows the sickness just passed; also a monthly bulletin, and sometimes publishes a quarterly bulletin containing the proceedings of the Board, report of work in the office of the secretary, and the condition of health during the quarter. The proceedings of sanitary conventions are published as soon as practicable after the occurrence of each convention.

The Secretary also disseminates information by means of the telegraph, the telephone, by letter, and especially by means of hektographed and neostyled statements prepared and distributed to members of the Board, to others interested in public-health work, and to newspapers in Michigan. Thus items of sanitary interest which are considered as useful "news" are published at once in comparatively ephemeral bulletins, etc., while the annual report is issued as a permanent official record of the work of the State Board of Health, of the office of the secretary, and of local boards of health throughout the State.

The annual report is not designed to serve as news; it contains statistics which require a great deal of painstaking care in their preparation, and which it is hoped will be useful, *for all time to come*, to those wishing to study the causation of diseases and, through their labors, to the people of this State and of the world. The statistics being preserved in a permanent form are accessible for study by a comparatively large number of persons.

Caution not to base general conclusions on very recent statistics.—One series of errors, very common among otherwise intelligent persons, needs special effort for its correction,—namely, the habit of thought which leads people to rely implicitly upon groups of facts of extremely recent collection, forgetting that the fact of their very recent collection makes it very probable, indeed almost certain, that they are exceptional; because nothing is better established in the science of statistics than that their collection during a long period of time is essential in order to eliminate those variations from the general truth which are almost constantly occurring.

The obverse of the error just mentioned is the habit of thought which leads people to belittle statistics which relate to a time not "up to date"—not for the last preceding calendar year, for example. A good knowledge of the fundamental principles of statistics is needed for the best use of statistics, but every person should be cautious about "jumping at a conclusion," and this caution is especially needful with reference to groupings of large numbers of facts—namely statistics—covering a brief time. For the interpretation of such statistics a background of similar statistics for a long period of time is needed.

The new law relative to the preparation of this annual report.—Act No. 44, Laws of 1899, is the general law which governs the printing and distribution of the various State publications, including the annual report of the State Board of Health. By that law this report is limited to 300 pages. While the report is less than half its size for recent years, the work of preparing it has been increased, because the volume should contain about the same data as before, only in a more condensed form. By the new law the publication of the annual report is not necessarily hastened, because *there is no requirement that the State Printer shall complete the work within a specified time*; but it is now necessary that the "copy" for an annual report must be completed by the officer making it and in the hands of the Board of State Auditors by December 1 of the year for which the report is made. This precludes the publication of the statistics of the Board for the same year for which the report is made; of necessity they must be for the previous year; and even then it requires rapid work to compile and condense the data in the time required by the law. Compliance with this law is difficult because the returns from health officers and others on which the statistical portion of the report

is based are slow in coming in, and it is sometimes several months after the close of a year before the work of compilation can be commenced. However, the law has been complied with, and it is hoped the result will be favorable to the interests of the public health.

Names and addresses of members of the board.—The names and post-office addresses of the members of the State Board of Health, and the dates of the expiration of their terms of office, are as follows:

FREDERICK G. NOVY, Sc. D., M. D., ANN ARBOR, January 31, 1899.*

SAMUEL G. MILNER, M. D., GRAND RAPIDS, January 31, 1899.*

DELOS FALL, M. S., ALBION, January 31, 1901.

HON. AARON V. McALVAY, MANISTEE, January 31, 1901.

FRED R. BELKNAP, M. D., NILES, January 31, 1903.

HON. FRANK WELLS, *President of the Board*, LANSING, January 31, 1903.

COLLINS H. JOHNSTON, M. D., GRAND RAPIDS, January 31, 1905.*

D. A. MACLACHLAN, M. D., DETROIT, January 31, 1905.*

HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

The members of the State Board of Health, with the exception of the secretary, are appointed for the term of six years, and receive no salary or per diem compensation for their services.

Standing committees of the State Board of Health.—Notwithstanding the assignment to committees of the duty of investigation in certain lines of work, each member is free to present any facts or views on any subject relative to or having any bearing upon the public health.

The committees as re-arranged and adopted by the Board, September 30, 1893, and the members appointed by President Frank Wells, January, 1898, are as follows:

1. Epidemic, endemic and communicable diseases.—Fred R. Belknap, M. D.
2. Sewerage and the disposal of excreta.—Frederick G. Novy, M. D.
3. Water supply, including purification of sewage-contaminated water.—Prof. Delos Fall.
4. Buildings, including house drainage, ventilation, heating, etc.—Samuel G. Milner, M. D.
5. Climate, geology, topography, and drainage.—Henry B. Baker, M. D.
6. Foods, drinks and their adulterations.—Prof. Delos Fall.
7. Poisons, explosives, etc.—Prof. Delos Fall, Sc. D.
8. School hygiene and sanitation.—Samuel G. Milner, M. D.
9. Sanitary inspections in cities and villages.—Hon. Aaron V. McAlvay.
10. Statistics of mortality and sickness.—Henry B. Baker, M. D.
11. Public-health legislation.—Hon. Aaron V. McAlvay.
12. Finances of the Board.—Hon. Frank Wells.
13. Animals' diseases dangerous to man.—Frederick G. Novy, M. D.
14. Relations of preventable sickness to taxation.—Fred R. Belknap, M. D.
15. Quarantine at the Michigan border and within the State.—Hon. Frank Wells.

WORK OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1899.

Aside from the work in committees and in connection with the office of the secretary of the Board, the work of the State Board of Health itself includes that done at sanitary conventions and at farmers' in-

*The law relative to the appointment of members of the board, provides that their term of office shall expire on January 31; but it has been held by an Attorney General that such an officer shall hold over until his successor has been appointed and has qualified. The term of office of Doctor Milner and Doctor Novy would have expired January 31, 1899, had their successors been appointed and qualified. The governor appointed Collins H. Johnston, M. D., of Grand Rapids, and D. A. MacLachlan, M. D., of Detroit. Doctor Johnston qualified March 16, and Doctor MacLachlan March 25. Until March 16, Drs. Novy and Milner continued to serve as members of the Board. The two new members attended the meeting of the Board April 14, 1899.

stitutes, that in connection with the examination of plans and specifications for proposed public buildings, and work done at regular and special meetings.

Sanitary conventions.—During the fiscal year ending June 30, 1899, the most important sanitary convention ever held in Michigan was the Quarter Centennial Celebration of the Establishment of the State Board of Health. It occurred at Detroit, August 9 and 10, 1898, in connection with the annual meeting of the Conference of Boards of Health of North America. Many health officers and others interested in public-health work were present, and the meeting was a very profitable one. Many prominent sanitarians from various parts of the United States were present, and it was a rare opportunity for health officers and others interested in sanitation to listen to those high in authority in public-health subjects. The proceedings of the celebration of the quarter centennial are printed in pamphlet form. It is Reprint No. 528.

Farmers' institutes.—Through the courtesy of the officers in charge of the farmers' institutes, held under the auspices of the State Board of Agriculture, members of the State Board of Health have attended farmers' institutes held in various portions of the State, and have talked to the people on subjects relating to good health, including the restriction and prevention of the dangerous communicable diseases. In this way the Board was able to supplement its educational work in connection with sanitary conventions. The opportunity has been a rare one and has enabled members of the Board to reach a class of people that is not usually well represented at the sanitary conventions.

Examination of plans for State buildings,—sewerage, ventilation and heating,—during the fiscal year ending June 30, 1899.—Act No. 206, Laws of 1881 (Sec. 2229, Compiled Laws of 1897; Sec. 15, Public Health Laws 1899), as amended by Act No. 86, Laws of 1889, and Act No. 58, Laws of 1897, is as follows:

"Sec. 7. That before the board of any charitable, penal, educational or reformatory institution shall determine on the plan of any building, or on any system of sewerage, ventilation or heating, which has been authorized by the legislature to be constructed, such plan shall be submitted to the Board of Corrections and Charities and the State Board of Health for examination and opinion thereon; and the board so submitting such plan shall, in its biennial report, show to what extent it was approved by the boards so examining them. And no money shall be paid out of the State treasury for the execution of any such plan or system until the Board of Corrections and Charities shall file with the Auditor General a written opinion that the proposed plan is of such character that the construction may be fully completed in accordance therewith at an expense within the amount appropriated therefor. That it shall be the duty of said State boards to visit said penal, educational, charitable and reformatory institutions when necessary to make the examination herein required, and their expenses necessarily incurred shall be audited by the Board of State Auditors and paid from the general fund.

It has been customary to print in this portion of the annual report the report of the Board's action in the examination of plans and specifications for proposed new State buildings; but, because of the new law referred to on a preceding page of this volume, these reports will not be published by this Board.

The last printed article on this subject will be found in the annual report of the Board for 1898, pages xii—xxvii.

REGULAR AND SPECIAL MEETINGS OF THE STATE BOARD OF HEALTH, DURING THE FISCAL YEAR ENDING JUNE 30, 1899.

The minutes of the regular and special meetings of the Board up to and including the meeting October 23, 1888, were copied into the permanent record books in the office of the secretary. From that time and including the proceedings of the meeting May 13, 1898, the minutes have been printed in the annual reports of the Board. The annual report for 1898 may be the last one in which the proceedings of the meetings of the Board are printed in full. Commencing with this annual report (for 1899) the new law of 1899 takes effect, and the volume will be greatly reduced in size, being limited to 300 pages. Accordingly mention only may be made of the times and places of meetings and members present at each of the regular and special meetings during the fiscal year ending with June 30, 1899.

Regular meeting, Lansing, July 8, 1898.—No quorum being present, the meeting was adjourned to meet in Lansing, July 15, 1898.

Adjourned regular meeting, Lansing, July 15, 1898.—The members present were: Hon. Frank Wells, president; Judge Aaron V. McAlvay, Prof. Delos Fall, Doctor Fred R. Belknap, Doctor Henry B. Baker, secretary.

Special meeting, Detroit, August 8, 1898.—The members present were: Hon. Frank Wells, president; Judge Aaron V. McAlvay, Doctor Frederick G. Novy, and Doctor Henry B. Baker, secretary.

Special meeting, Lansing, October 12-13, 1898.—The members present were: Hon. Frank Wells, president; Judge Aaron V. McAlvay, Prof. Delos Fall, Doctor Frederick G. Novy, and Doctor Henry B. Baker, secretary.

Regular meeting, Lansing, October 14, 1898.—There being no quorum present, the meeting was not held, the necessary business having been transacted at the special meeting of the Board, October 12 and 13, 1898.

Regular meeting, Lansing, January 13, 1899.—The members present were: Hon. Frank Wells, president; Judge Aaron V. McAlvay, Doctor Frederick G. Novy, Doctor Fred R. Belknap and Doctor Henry B. Baker, secretary.

Regular meeting, Lansing, April 14, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Doctor Fred R. Belknap, Doctor Collins H. Johnston, Doctor D. A. MacLachlan, and Doctor Henry B. Baker, secretary.

BIENNIAL REPORT OF THE STATE BOARD OF HEALTH, DECEMBER, 1898.

TO THE GOVERNOR AND LEGISLATURE OF MICHIGAN:

GENTLEMEN—A desire to promote the public welfare dictates that, on the assembling of the legislature, there shall be put before the chief executive and the law making powers salient facts relative to conditions affecting the public health which may be improved through legislation. Accordingly, this report briefly mentions such conditions which, in the opinion of the State Board of Health, seem most strongly to require action by the legislature.

Consumption.—In Michigan, as in other States, the most important danger to the

public health is consumption and the other diseases caused by the bacillus tuberculosis. The deaths from diseases caused by this germ greatly outnumber those from any other disease. Now that the specific cause of the disease is known, and the several ways in which the disease is spread are also known, and the measures for the restriction of the disease are so well understood, the most important being the destruction of the sputa of every consumptive person, consumption is believed to be one of the easiest diseases to restrict and prevent. But its restriction and prevention require such spreading of information and such coöperation of all classes of people as can be had only through legislation based upon those important facts relative to this disease which have been thoroughly established in sanitary science.

The legislature should require consumption to be more promptly reported to the local health officer.—The present law requires every physician called to a case, and every householder in whose household a "disease dangerous to the public health" occurs, to report the case to the local health officer. Such knowledge of the existence and exact locality of a dangerous disease enables the officer to act for its restriction, by warning those endangered, by educating the patient and his associates how to restrict the disease, and by disinfection of premises. Unfortunately, health officers, especially in cities, are not now generally officially informed of the existence of consumption in their localities until after the death of the patient and they have been notified of the facts by the Secretary of the State Board of Health, who has obtained the information from the office of the Secretary of State where, under the law, the cause of each death in the State is reported. It is then too late for the health officer to do much for the restriction of the disease. The victims of consumption are usually sick at least two years, and during this period are centers of infection, especially to their families and friends who are usually ignorant of the simple precautions necessary to avoid contagion.

The enforcement of the law for the reporting of a "disease dangerous to the public health" against a person who fails to report consumption is difficult, because consumption is not mentioned in the law, and there is no law which determines who shall decide what is a "disease dangerous to the public health."

The law should be amended so that, either consumption shall be mentioned as one of the diseases dangerous to the public health (it is now known to be the most dangerous communicable disease) or the State Board of Health be authorized and directed to declare what diseases are "dangerous to the public health" and therefore required to be reported. This last method would be useful with reference to other diseases than consumption because, on account of the progress of sanitary science, diseases are from time to time discovered to be communicable which were not previously known to be such.

State hospital for consumptives.—There are in Michigan several thousands of persons who have consumption; many of them are poor and ignorant of the ways whereby the disease is spread; they are centers of infection from whom thousands of our citizens will catch this dreadful disease, unless some measures more speedily effective than any heretofore employed shall be adopted. There are hundreds of such poor and ignorant consumptives who will continue to spread the disease unless they can be given more thorough instruction and training in methods for its restriction than can be given them by the talk and influence of the local health officers or the literature distributed by the State Board of Health. In order to stop their destructive carelessness they should be cared for and instructed in a special hospital or sanatorium, where their chances for recovery would be better than in their homes, and where their sanitary education can be enforced so that, whether cured or not, they can soon go out from the sanatorium so well informed on the subject that they will cease to be centers of infection.

To make this great measure for the lessening of consumption most practicable, there is needed:

1. At least one "State Sanatorium for Consumptives." This requires an appropriation, for construction, and for some portion of its maintenance.

2. Some system for selecting those consumptives most endangering the people of Michigan, and most suitable for care and instruction in the sanatorium. This may be facilitated by requiring inspections and action by the local health officers throughout the State.

3. Some system for determining the duration of the stay of consumptives in the sanatorium.

4. Some system of division of the expenses of caring for consumptives, apportioning some of the expenses to the counties from which the consumptives are

sent, and some to the individual consumptives, if able to pay. Provision for this may be made in the law establishing the hospital.

The Michigan State Board of Health was one of the first, perhaps the very first to propose such a State Hospital for consumptives. It was proposed in April, 1894. A proposed bill to establish such a hospital is printed on pages xxviii-xxx of the annual report for 1895. The amount recommended to be appropriated by the State of Michigan, for the construction of the hospital, was sixty thousand dollars. This is almost precisely the amount since then appropriated for a similar purpose by Cook County, Illinois. The Cook County Sanitarium has been built and is now in effective operation. It accommodates 380 patients. Many governments have appropriated money for this purpose, and this is now quite generally recognized as a very important measure for lessening the spreading of this most dangerous communicable disease. It is reported that the result of the national subscription made in Sweden on the occasion of the King's jubilee, is to be devoted to the building of a hospital for consumptives.

Michigan cannot now be a pioneer in this important work; but it should not longer delay to act for lessening the immense losses of money* as well as of life consequent on the spread of consumption by poor and ignorant consumptives, many of whose lives may be saved, and nearly all of whom may be so taught that they will cease to be a menace to all in their vicinity.

Though the first outlay will be considerable, yet the saving in human health and life, and even the money values may reasonably be expected to be ample compensation to the taxpayers for the expenditures such a sanatorium will require.

The State Board of Health hereby earnestly memorializes the legislature to enact such a law as shall establish in Michigan a State Hospital or Sanatorium for Consumptives.

A State law requiring tuberculin tests of all cows which supply milk to cities and villages, and preventing the sale of milk from tuberculous cows, greatly needed.—Under the present law, the State Live Stock Commission has no power to make examinations and tests of dairy herds except there is previously reason to believe that the animals have tuberculosis or some other dangerous communicable disease. Such evidence of tuberculosis cannot usually be obtained previous to the tuberculin test. A few years ago the State Live Stock Commission tested two herds which supplied milk to Detroit. They found many animals dangerously infected with tuberculosis. There is now reason to believe that many of the cows which supply milk used in Detroit are tuberculous and that the use of the milk uncooked endangers the health and life of the people. The same is true relative to other parts of Michigan. Why has not the examination and testing of animals continued?

There are two reasons: (1) The present imperfect law contemplates action by the State Live Stock Commission for the protection of animals only; that board is not authorized by the present law to act for the protection of the human species. (2) The herds found tuberculous near Detroit belonged to comparatively wealthy persons who invoked the law's delays by injunctions to thwart the action of the State Live Stock Commission; and one of the cases is still unsettled by the courts. Meeting with such resistance, the State Live Stock Commission has been unable to proceed with the tests, except when owners request it, or specific complaint is made.

Consumption and the other diseases due to the bacillus tuberculosis cause more deaths in Michigan than any other disease, in fact more than three other important dangerous communicable diseases now being attempted to be restricted. Although it is believed that the disease is spread most frequently by the dried sputa of coughing consumptives, yet it is also believed that very considerable proportions of the tubercular diseases such as tubercular meningitis of children, consumption of the bowels, etc., are caused by the use of uncooked milk from tuberculous cows. Now that the tuberculin test has been proved to be a certain test for tuberculosis in cows, it would be an easy thing to test every animal which supplies milk to be publicly sold for use in cities and villages. The State Board of Health, and sanitary meetings under its auspices have several times recommended that this be done. For instance, at the sanitary convention at Stanton, in 1893, Dr. Baker, Secretary of this Board, recommended giving the State Live Stock Commission the power and making it its duty to inspect animals for tuberculosis; at the meeting of Michigan Health Officers at Ann Arbor, in 1894, in discussing the question, "What legislation is needed for the restriction and prevention of tuberculosis," Doctor Granger, then

*The secretary of this board has estimated that the money losses from this disease in Michigan amount to more than three millions of dollars per year.

a member of the State Board of Health, urged the establishment of "a hospital for indigent consumptives at the State University, and a systematic inspection of animals, to obviate the sale and use of food products that are dangerous to the public health." Professor V. C. Vaughan, of the University, then a member of the State Board of Health, offered a resolution, which was adopted, as follows:

"Resolved, That the legislature of this State be asked to pass a law which shall prohibit the selling of milk without a license from the State Live Stock Commission, said license to be granted after an examination of the milch-cows by the State Veterinarian or a competent veterinarian shall have shown them to be free from tuberculosis, the tuberculin test being applied in case of doubt."

The legislature has not yet passed such a law as the above-mentioned one asked for by the health authorities of the State. Only a few of the cities have taken the subject up and passed ordinances providing for this very important work: Kalamazoo has wisely acted, but a large portion of the State, including Detroit, is still unprotected from this great danger.

The State Board of Health again earnestly memorializes the legislature to pass a law which shall provide for the testing of all milch-cows the milk from which is sold, and for stopping the sale of milk from animals proved to be tuberculous.

The influx of ignorant doctors endangers public health.—Many states have passed laws which require minimum qualifications in persons permitted to practice medicine. Michigan does not require such persons to be qualified; therefore Michigan is being overrun with incompetent doctors from other States. Nearly every mail brings to the Capitol at Lansing from some quack or other such person in another state, desiring to practice medicine in Michigan, a request for a copy of the Michigan law relative to the practice of medicine. Not only this, but unqualified persons in Michigan are taking up the "doctor's trade," stimulated to do this by advertisements of unscrupulous persons who send to druggists and others throughout Michigan statements of how easy it is to get a "diploma" which will enable them to register in Michigan and practice as "doctors." A diploma can be purchased for a few dollars in Chicago. Many such "graduates" have started out to practice medicine in Michigan. Their unskillful practice greatly endangers the public health and safety; but the evil does not stop there,—local boards of health do not usually pay the health officer as much as a first-class physician can earn by the practice of his profession, and by serving as health officer he antagonizes some of his regular patrons, therefore many well-educated physicians decline to serve as health officers; for this reason, and because local boards of health frequently have no way of learning the qualifications of persons who set themselves out as doctors, and because these incompetent impostors strive to get the positions as health officers, many of them are today serving the people of Michigan as health officers, pretending to guard the interests of health and life in their jurisdictions.

Such ignorant doctors endanger the public health in many ways, a few more of which may be mentioned: Not having had the training of a proper medical college, many of them cannot recognize a dangerous communicable disease when they see it, therefore such diseases are not promptly reported by them to the health officer; meantime the disease spreads, sickness which should have been prevented occurs, and sometimes loss of life, as well as of time and money. The diseases in which these mistakes occur most frequently are diphtheria and typhoid fever; but smallpox is generally called chicken-pox by such doctors. On the other hand, these doctors often report cases as diphtheria and typhoid fever, and health officials and others are thus required to incur expense for the restriction of such cases which an intelligent physician would recognize as a mild disease not requiring any public expense.

The public health suffers directly through the practice of these ignorant doctors, because, even if one of them does learn what disease his patient has, he is unskilled in the use of the most approved remedies which should be employed.

The people generally have no way whereby to judge of the qualifications of a physician. A lawyer's work is mostly in open court where all may see and hear the work and the results. Yet the State law requires that, before being trusted to do the people's law business, the lawyer must first pass a successful examination; how much more ought the State to guard the people from incompetent persons who pretend to deal with their very lives and health, and really have to do with their money expenditures and forfeitures to an extent worthy of comparison with that with which the lawyers deal.

A law should be enacted which should require certain minimum qualifications of all who commence the practice of medicine in Michigan.

The influx of incompetents has already been so great that a law ought to be enacted which shall require the examination of those already in practice, at least so far as to exclude from subsequent practice all who cannot pass a reasonable examination to test their knowledge of the prominent characteristics of the dangerous communicable diseases, and of the laws of Michigan which relate to the reporting and care of such diseases, and the duties of health officers, that office being the one so many of them are striving to fill.

The deterioration of the rank of the physicians of Michigan.—The evil results of the influx and increase of incompetent doctors do not stop with simply adding them to our supply, because they displace those who are qualified and who in response to the demand for educated physicians made by the laws of other States, go to the States which these ignorant ones have been forced to leave. Thus the medical department of the Michigan University, and other medical colleges in Michigan, with their four-year courses of study, turn out many sons of Michigan well-educated physicians, who, if they settled in Michigan, would soon rank high in the profession and be an honor to the State as well as supplying our people with the best medical and public-health service, but who are too intelligent to settle down in a State which permits an ignorant pretender who has purchased a diploma to stand on the same footing as the best educated physician who has spent four years in its own university in preparing himself for intelligent service.

The State Board of Health hereby earnestly memorializes the legislature to put a stop to this condition which so seriously affects the public health and welfare.

Lack of compensation of health officers is unfavorable to the public health.—In every township, city and village, whether or not the public health is properly guarded against preventable sickness and deaths, depends very much upon whether or not the health officer is the best that could be had. In their desire to save the people's money, local boards of health quite generally so poorly compensate a health officer that no first-class physician can afford to accept the duties and responsibilities. Frequently local boards report to the Secretary of the State Board that it is impossible for them to comply with the law which requires them to appoint and "constantly have a health officer" who must be a "well-educated physician," for the reason that no such physician will accept the position. They do not need to state why they will not accept; it is plain that it is because there is not sufficient inducement. This is likely to continue, to the detriment of the public health, until the people who elect the local boards shall appreciate the importance of a good health officer. It is believed that this time may be hastened by means of a law which shall require a public meeting in every locality, at which the local board of health shall be required to report what it has done during the past year, and at what expense; the health officer and the board shall be required to outline what shall be done during the coming year, with reference to the restriction of each important disease, and present estimates of the expenditures which are likely to be required, which estimates are to be approved or disapproved by the public meeting. A method similar to this is now in practice in this State by the school officers, relative to expenditures for school purposes. Are not the lives and health of the people themselves of more importance than any other subject for which they collect taxes? A large number of the deaths in Michigan are from a few of the dangerous communicable diseases, and these are preventable. But they cannot be prevented until the people generally co-operate for their prevention. It is believed that conference at an annual public meeting will tend greatly to facilitate such co-operation and consequent restriction of disease, and the prevention of untimely deaths.

The State Board of Health hereby memorializes the legislature for the establishment, by law, of an annual public meeting of the local board of health and taxpayers in every township, city and village in Michigan.

Investigation and oversight of water-supplies.—The State Board of Health is unable to enter upon systematic investigations regarding the pollution of river and lake waters used as water supplies, or to carry on such sanitary survey and oversight of the water supplies of the State as is done in some of the other States, as for instance in Ohio and Massachusetts. In Massachusetts the appropriation for such purposes is thirty thousand dollars per year, in addition to the \$15,800 for the general work of the board.

No specific request is made for an appropriation for these purposes; but the State Board of Health is ready to enter upon such work whenever the legislature shall deem it best to make the appropriation. In case the small appropriation for general purposes, asked for by this board, is granted, some portion of that may

be used in such testings of water-supplies as are likely to yield information of general use throughout the State.

Means for carrying out the general purpose for which the State Board of Health exists.—The general purposes for which the State Board of Health exists are the general supervision of all the health interests of the people, with reference not alone to any single disease or danger however great, but to all diseases and dangers. In the progress of sanitary science new facts are developed which demand new actions. The State Board of Health has never yet had an appropriation for general purposes,—every appropriation has been tied up to particular purposes specified in the act. The result is that the board is continually hampered, and frequently cannot do as well as it could if it were permitted to use its funds for the work most needed. For the past few years its appropriations have not been sufficient to do what has been required by existing laws. (Its appropriations have been considerably less than those for the local board of health in Detroit.) The State Board hereby memorializes the legislature for a small appropriation, of a few thousand dollars, "For the general purposes for which the board exists," to enable the board to meet new conditions as they arise, as, for instance, the testing of new methods for disinfection or other measures for the restriction of disease, the investigation of special outbreaks of disease to learn their causes, in order to make general recommendations based upon knowledge thus gained.

Respectfully submitted, by direction of the State Board of Health.

FRANK WELLS,

President.

HENRY B. BAKER,

Secretary.

PUBLIC HEALTH LEGISLATION AND PROPOSED LEGISLATION.

Laws enacted in 1899 relating directly or indirectly to the public health.—The act passed by the Legislature of 1899, which changed, in a measure, the method of distributing the reports of the Secretary of the State Board of Health, as well as the size and number of the reports is as follows:—

Act No. 44. Laws of 1899.

An act to provide for the publication and distribution of laws and documents, reports of the several officers, boards of officers and public institutions of this State now or hereafter to be published, and to provide for the replacing of books lost by fire or otherwise, and to provide for the publication and distribution of the Official Directory and Legislative Manual of the State of Michigan, and to repeal act number one hundred twenty-two of the session laws of eighteen hundred eighty-nine, approved May thirty-one, eighteen hundred eighty-nine, act number twenty of the session laws of eighteen hundred eighty-nine, approved March nineteen, eighteen hundred eighty-nine, and all other laws or parts of laws contravening or inconsistent with this act.

Sec. 9. The annual report of the Secretary of State of the births, marriages, deaths and divorces shall be printed and bound for distribution as follows: Two hundred copies for the State Board of Health, for distribution by said board in their discretion, and for distribution by the Secretary of State such number of copies as he shall deem necessary, not exceeding two thousand in number. Also a sufficient number of the monthly bulletin of vital statistics shall be issued by the Secretary of State to supply registrars, health officers, newspapers published in Michigan, libraries, county officers and other persons making special requests for the same.

Sec. 10. A sufficient number of copies of the annual report of the Secretary of the State Board of Health shall be printed to supply the office of the Secretary of State with two hundred copies for future distribution, and as many copies for use and distribution under the direction of the State Board of Health as said board may deem necessary, but the whole number of copies printed and published under this section shall not exceed four thousand. Such reports, when printed, shall be delivered on the order of the Secretary of State to the Secretary of the State Board of Health; such report shall not exceed three hundred pages, including context and index, said pages to be of size of the pages of the report of said Board of Health for the year eighteen hundred ninety-four.

Sec. 15 of the act provides that "the State Board of Health is hereby authorized to expend, in any one year, not exceeding one hundred dollars for printing and binding bulletins."

Two acts were passed in relation to the manufacture and sale of certain

foods, one a new act and the other certain amendments to an already existing act, which, though for the regulation of, and under the direction of the Pure Food Commission, were in the interest of public-health, and were as follows: Act No. 106, Laws of 1899, entitled "An act in relation to the sale and delivery of milk," and Act No. 268, Laws of 1899, entitled "An act to amend sections six, seven, nine, eleven and twelve of act number two hundred and eleven of the session laws of eighteen hundred ninety-three, approved June two, eighteen hundred ninety-three, entitled 'An act to provide for the appointment of a Dairy and Food Commissioner and to define his powers and duties and fix his compensation,' as amended by act number two hundred and forty-five of the session laws of eighteen hundred ninety-five, approved June one, eighteen hundred ninety-five, as further amended by act number one hundred and fifty-four of the session laws of eighteen hundred ninety-seven, approved May twenty-four, eighteen hundred ninety-seven, being sections four thousand nine hundred and seventy-eight, four thousand nine hundred and seventy-nine, four thousand nine hundred and eighty-one, four thousand nine hundred and eighty-three and four thousand nine hundred and eighty-four of the Compiled Laws of eighteen hundred ninety-seven."

A blow aimed at bogus "doctor factories" in Michigan was struck by the secretary of this board when he drew the following bill which was introduced by Mr. Goodrich in the House, and passed by the legislature of 1899:

Act No. 151, Laws of 1899.

An act to specify the sources of authority for the issuing of medical diplomas; and to prevent the issuing of medical diplomas, and certificates to serve as diplomas, by unauthorized corporations or persons.

The People of the State of Michigan Enact:

SECTION 1. That, excepting licenses issued in accordance with law by the State Board of Medical Examiners, and diplomas issued by the University of Michigan, it shall be unlawful for any person or corporation except a legally incorporated and reputable college of medicine and surgery having and requiring actual attendance at a course of study of not less than three years of eight months each, to issue a diploma or certificate setting forth or implying that the holder thereof is qualified to practice medicine or surgery, in any of their branches. Whoever shall violate this section shall, on conviction, be deemed to be guilty of a misdemeanor, and be punished by a fine not less than one hundred dollars, nor more than five hundred dollars, or by imprisonment in the county jail not exceeding ninety days, or by both such fine and imprisonment, in the discretion of the court.

SEC. 2. All provisions in existing law inconsistent with this act are hereby repealed.

Act No. 205, Laws of 1899 (Secs. 273 and 274, Public Health Laws, 1899), entitled "An act to compel the maintenance of water-closet accommodations for workmen on buildings during course of erection" was a measure indirectly in the interest of public-health.

Act No. 80, Laws of 1899 (Secs. 175-177, Public Health Laws 1899), "An act to prevent and punish the pollution and contamination of the waters of the stream known as Wolf Creek, in Lenawee County, Michigan, and the tributaries thereof," was another along the line of public-health.

The most important act, from the medical practitioner's point of view, was act No. 237, Laws of 1899 (Secs. 217-227, Public Health Laws 1899), "An act to provide for the examination, regulation, licensing and registration of physicians and surgeons, and for the punishment of offenders against this act, and to repeal acts and parts of acts in conflict therewith." It is a measure that has been advocated by the State Board of Health for very many years; and at each session of the legislature in recent years, this board has either presented a bill having in view the

same result, or has been a warm advocate of other measures along the same line. This bill is what has been needed in Michigan for many years, and its earlier enactment would have avoided the dangers to the public-health caused by the ignorance of those who, registering under a diploma from some bogus medical college, have been a menace not only to the health of those persons who employed them, but a menace to the public-health, because of their not knowing and reporting cases of the dangerous communicable diseases to the local health officer. A similar bill, formulated and drawn by this Board, was introduced in the house by Mr. Goodrich, but was not passed, giving place to this act, which was introduced in the Senate.

Proposed public-health legislation.—Several of the bills introduced before the legislature at the session of 1899, relative to the public-health, and towards improvement along the line of public sanitation, were not passed. Senate Bill No. 126, introduced by Mr. Flood, entitled "A bill to define the terms 'Sickness dangerous to the public-health' and 'Disease dangerous to the public health,' employed in Sections 1647, 1675 and 1676 of Howell's Annotated Statutes, Section 1 of act 137 of the public acts of 1883, and elsewhere in the laws of Michigan, and to provide for the publication of a list of said diseases," was introduced with a view to establishing a rule by which the dangerous communicable diseases might be thoroughly established, and so that there would be no future question either in the minds of the householder or of the health authorities as to what the dangerous communicable diseases were, that the laws relative to the restriction and prevention of such diseases might be enforced in all instances in which the communicability of the disease might be in question, and that the enforcement of the penal statutes might not be prevented on some technicality.

Senate bill No. 408, introduced by Mr. Collingwood, entitled "A bill to provide for the testing of all milch cows, the milk from which is sold for use in incorporated cities and villages, and for stopping the sale of milk from animals proved to be tuberculous," was introduced for the purpose that in the future the people in cities and villages might be protected from the sale and use of milk from cows infected with tuberculosis. It required, in substance, that milk sellers be required to carry on their trade under a license from the board of health, to be granted them after a tuberculin test of the cows, by the State Live Stock Sanitary Commission.

House bill No. 131, introduced by Mr. Goodrich, entitled "A bill to promote the public health, by commencing to regulate the practice of medicine and surgery, through the establishment of a State Board of Medical Examiners," was superseded by the bill which became Act No. 237, Laws of 1899 (Secs. 217-227, Public Health Laws 1899), mentioned above.

House bill 606, introduced by Mr. Goodrich, entitled "A bill to establish and maintain a State Hospital for Consumptives, and to make an appropriation therefor," was, perhaps, one of the most important enactments, from the sanitarian's point of view, asked for during the session of the legislature of 1899. It is a measure long and seriously considered by the State Board of Health, and one which experience has taught is feasible, in the restriction and prevention of this most fatal of diseases. It is to be hoped that continual application and persistence will prevail

on some legislature to provide for the erection and maintenance of a hospital for consumptives.

House bill 169, introduced by Mr. Goodrich, entitled "A bill making an appropriation for the use of the State Board of Health for general purposes for the promotion of the public health," was introduced, but not passed.

PRESIDENT'S ANNUAL ADDRESS.*

PROGRESS OF SANITATION IN MICHIGAN, AND SUGGESTIONS FOR NEEDED IMPROVEMENTS.

BY HON. FRANK WELLS, PRESIDENT OF THE STATE BOARD OF HEALTH,
LANSING, MICHIGAN.

To the Members of the State Board of Health:

GENTLEMEN—Though the two years which have elapsed since you listened to the last biennial address required by the rules of this board have not been marked by the inauguration of any new lines of work upon your part, yet they have in several ways been years of unusual interest and value. Chief among the events of importance embraced in this period which have rendered them so was the celebration in August last of the Quarter Centennial of the establishment of this board.

This celebration, held in Detroit the day before the annual meeting of the State and Provincial Boards of Health of North America, was participated in by many of the most prominent sanitarians of this country. Papers and addresses by a large number of these men famous in various departments of public-health work exhibited a history of the development of sanitary knowledge during the period of the existence of this board most striking and interesting. This history shows that it is only during the twenty-five years which have witnessed the activities of the Michigan State Board of Health that there has been evolved a sanitary science. It also shows that through the assimilation of this knowledge as it has been developed, and its practical application, lives have been saved and suffering prevented in a yearly increasing ratio.

In this work the Michigan State Board of Health, in the opinion of its contemporaries, stands second to no other similar organization in the country. The encomiums passed upon this board, the credit it received, and the honor accorded it upon this occasion for its intelligence and activity, and the high measure of appreciation expressed for its secretary, Doctor Baker, not only honor him and the gentlemen who from time to time have formed its membership, but they are a high and deserved tribute to the people of the State who have sustained the efforts of the board not unfrequently in the face of criticism and abuse inspired by ignorance, prejudice or selfishness. While the recognition expressed from so many sources of the value of the work of this board is extremely gratifying, yet the gratification is accompanied by a realization that to retain the high position accorded it no light responsibility devolves both upon its members and upon the people of the State.

Can it be said of this board at the close of its next quarter century of work as was said by Dr. Benjamin Lee, of Philadelphia, president of the conference, at the close of the last: "There is no Board of Health in the United States which does not look upon Michigan as the source of its inspiration," or will the words of Prof. Lindsay, of Yale College, ex-president of the conference, spoken at the same time, "It has been a conspicuous symbol of the intelligence, the well-directed enterprise and wisdom of the people of Michigan," be true then as they were when spoken last August?

I believe the members of this board will not be satisfied with the laurels already won, and I have full confidence that they will continue to keep in the van of that great army which today all over the civilized world is successfully contending with the foes of life and health. I have equal confidence in the people and in the influence which the teachings of this board concerning the causes of the most

*April 14, 1899.

dangerous diseases and how they may be avoided have had upon them. This influence manifested at sanitary conventions, farmers' institutes, and in various other ways shows that the work of this board is understood and appreciated by them and that they are willing and anxious to sustain it most liberally in all its efforts.

In considering the future of this board it is well to bear in mind that increasing knowledge concerning the causes of all communicable diseases must correspondingly increase the problems concerning their prevention. During the early history of this board persons were supposed to become contaminated only through contact with persons or things known to be infected with such diseases as were then believed to be contagious. The formulæ isolation and disinfection were the only ones then deemed necessary to prevent the spread of such diseases. Today, when the list of diseases belonging to this class has greatly increased and danger from contagium lurks in the air we breathe, in the water we drink, and in the food we consume, these formulæ alone are insufficient. New sources of contamination of these necessary substances of our existence are being continually discovered, and new methods therefore for counteracting their influence must be sought. For these reasons sanitary problems are becoming daily more complex and require for their solution a steadily increasing expenditure of time, effort and money. While the members of this board can undoubtedly be depended upon to contribute as liberally of time and effort in the future as they have in the past, can popular estimation of the value of these contributions be depended upon to enable the board to enter upon new fields of sanitary work or even to properly carry forward the works it has already inaugurated?

Several lines of work it had entered upon and which had yielded excellent results have been permitted to languish for want of the necessary funds to keep them in active operation. Among these are sanitary conventions, a pioneer work of this board, for which it has received unstinted praise from its cotemporaries, and expressions of enthusiastic appreciation from the people wherever these conventions have been held. For want of funds, no sanitary convention has been held by this board since January, 1898, about a year and a quarter. Previous to that time the yearly average of these conventions was two and one-half.

Another most valuable work inaugurated by this board, an annual conference of local health officers, has been abandoned for the last two years for a similar reason. These conferences were of great value, for they brought together, for instruction and comparison of experiences, the officials to whom every community must look for the stamping out promptly of each outbreak of a dangerous communicable disease. It would be difficult to overstate the importance to the people of these conferences and I sincerely hope that means may be found to hold one this year and each year thereafter.

Since the acts making the present annual appropriations for the uses of this board were passed, the taxable property of this State as equalized has increased about one hundred per cent, and its real value probably much more. The population of the State has about doubled and the increase in schools, churches and other buildings indicating an intelligent and progressive people has been in about the same proportion.

Best of all, the health of the people has been improving steadily from year to year, the average deaths per 1,000 for 1898 being only 12.5. The vital statistics of the State show a constantly diminishing number of deaths from nearly all of the communicable diseases. Some of these diseases have almost ceased to exist in our borders, and we now rarely hear of the ravages of epidemics so common in communities twenty-five years ago. While the improved healthfulness of the State may not all be credited to the efforts of this Board, yet it is, I believe, entitled to much the largest proportion of it.

The board has asked the present legislature for a moderate increase of the appropriation made twenty-five years ago for general purposes. In view of the accomplishments of the board, of the increase of its duties, of increase in population, and wealth of the State, it should require no argument to show the need for the small increase of five thousand dollars to its annual appropriation.

It is gratifying to note a reduction in the death-rate from consumption in Michigan since this board began its active campaign for its restriction less than six years ago. It is the last of a series of diseases which this board has from time to time placed upon the list of those dangerous to the public health. That this disease has begun to relax its hold, as did all the others following such action, should surprise none but those ignorant of the successes which have so uniformly

crowned the efforts of the Michigan State Board of Health. As you know, this board was a pioneer in its active measures for the restriction of consumption as it had been for the restriction of so many other diseases and in other lines of public-health work. Though the Michigan board was commended for its early campaign against this disease by many other State boards yet no other had the courage at that time to take this advanced step. State and municipal boards are now following the lead of Michigan so that today in many of the States and large cities active measures are being taken for the restriction of this disease. These measures embrace not only the education of the people as is sought to be done by this board, but hospitals for consumptives are being built by both states and cities where the poorer victims of this disease may be properly cared for and cease to menace the lives of their families and neighbors. In addition to this, many States and cities are requiring that the flesh and milk of animals, used for food, be inspected by legally authorized officials as another means for preventing the spread of this disease.

This board was among the first in this country to recognize the importance of a State hospital for consumptives. A bill was introduced into our legislature four years ago providing for an appropriation for this purpose; its passage was urged then and two years ago by members of this board, but at both sessions it failed to pass. This bill is before the present legislature, and again this body is asked to provide means for the building and equipment of a hospital for the consumptive poor of Michigan. It is not alone for the benefit of this class that this is asked. An exclusively consumptives' hospital is needed for the operatives in factories, in workshops, in dairies, and in stores to prevent contamination of the numerous articles that the large number of consumptives employed in these industries are manufacturing, selling or coming in contact with destined for the furnishing of homes and for the food and clothing of their occupants.

While it is by means of the dried sputa of consumptives that this disease is usually spread, yet the meat and milk of tuberculous animals are now quite generally recognized as sources of infection for this disease. This is especially true of milk, and this common and valuable food has been shown to be the cause of a large proportion of the mortality of young children reared upon it who have died. Tests made by the Live Stock Commission of this State have shown that many herds of cattle in Michigan are affected with this disease and there are doubtless very many more contaminated which have not been tested, and which are furnishing milk containing the deadly parasite of consumption to thousands of children in Michigan today. Systematic inspection of dairy cattle is imperatively demanded and the influence of this board should be exerted to the utmost to secure the passage of the bill for this purpose before the present legislature. The mothers and fathers of Michigan have a right to demand a law which shall insure a food supply for their infants free from a poison which causes more deaths in Michigan in one year than the adulterations of all other foods have ever caused.

The Michigan State Board of Health should relax no effort for the restriction of a disease which not only causes most deaths in Michigan, but which causes them in largest proportion between the ages of twenty and thirty years, when lives are of greatest value. The success of these efforts thus far has been very encouraging. In 1891 this board issued its first leaflet on the restriction and prevention of consumption. Of these leaflets 70,000 have been printed and distributed throughout the State, largely among those in whose families the disease was known to exist. Since this work was begun there has been an average annual reduction of eleven per cent of the death-rate from consumption. I believe that the cause for this remarkable result is largely the influence of this leaflet sent to the families and neighbors of the victims of this disease, and the other educational influences emanating from this board. These influences may be greatly increased and the reduction of the death-rate from consumption made still more rapid by the passage of the bills providing for the building of a hospital for consumptives and for the inspection of cows furnishing milk to cities and villages. Leaving out humanitarian views and considering only the material interests involved, there is ample evidence to show that this legislation would be of great pecuniary value to the State. The cash value of even a small percentage of those who die of this disease in Michigan every year would amply compensate for the outlay involved in the passage of these two bills. The lives of the citizens of no other community in the world are of greater pecuniary value than are those of the men and women of Michigan. They have changed, during the existence of some still living, a wilderness into a flourishing State of cities, villages and farms, built churches and

schools and built and sustained a university whose fame is world-wide. These accomplishments indicate a high plane of industry, intelligence and morality. But consumption is restrained by none of these virtues, and each year three thousand of these men and women in Michigan leave their homes and the avocations which add wealth to the State and go down at the beck of this destroyer to untimely graves.

Each one of these deaths was preventable, each one that is to follow will have been, and the responsibility for them will rest with those who, having the knowledge and the ability to save, failed to act.

While consumption leads the list of the diseases most dangerous in Michigan, it is followed more or less closely by another scarcely less fatal. Pneumonia caused the death directly of 2,465 persons in Michigan in 1898. In fact during this year pneumonia was actually the cause of six more deaths than consumption, the mortality due to the latter being 2,456, as reported to the vital statistics department of the Secretary of State. [And right here I want to congratulate this board upon the increased value of these statistics under the operation of the vital statistics act passed at the last session of the legislature in 1897. Before that period the vital statistics of this State were based upon incomplete returns and, although useful for some purposes, little reliance could be placed upon them for other purposes. Now they are practically perfect, and under the careful direction of Doctor Wilbur, the accomplished statistician of the State Department, they furnish data upon which the scientific work of this board can be safely based.] Pneumonia, then, was the greatest destroyer of life in Michigan during the last year. Though this was perhaps an exceptional year, yet the records of previous years show this disease to be but little behind its great competitor in the harvest of human lives. Like consumption, it is a germ disease; and, like consumption, it is caused by the germ peculiar to it gaining access to the air passages and lungs. The germs of pneumonia have frequently been found in the saliva of healthy persons thereby leading to the conclusion that they may be harmless until conditions arise, like a sudden reduction of the bodily temperature or some other cause, which may lessen its resisting power and thereby favor their introduction into the lung tissue. Though our knowledge regarding the etiology and communicability of this disease is still imperfect, yet it appears to me that we are already in possession of sufficient facts concerning it to warrant the publication of a leaflet containing all the reliable information available at this time likely to prove of value in its restriction for general distribution.

Another disease which from time to time assumes an epidemic form and which has prevailed during the past winter with marked characteristics of this form is influenza, commonly known as gripe. This also is a germ disease, the organism causing it having been isolated from bronchial mucus and cultivated in artificial media by Pfeiffer. Its development is doubtless greatly favored by certain meteorological conditions which diminish, as in pneumonia, the resisting power of the body to the attacks of the organism peculiar to this disease.

All the diseases I have named, and one other, catarrh, more prevalent though much less dangerous than either of the others, and including diphtheria standing next to pneumonia as a direct cause of death, would probably disappear if it were possible for the sputa and nasal discharges from each victim of either disease to be immediately disinfected or destroyed. The habitat of the organism peculiar to each one of these diseases except consumption is in the throat or air passages, and in consumption it is usually in the lungs. Sufferers from nearly all are frequently walking invalids during a large portion of the progress of the diseases with which they are afflicted. In the early stages, in convalescence and not infrequently during the entire period of illness, they may be found in schools, in stores, in workshops, in churches, upon railroad cars and upon the streets, pursuing their usual avocations and distributing their saliva impartially, like the gentle rain of heaven, upon the just and the unjust. Each drop of mucus containing its millions of parasites is dried by the sun, wafted by the breeze, or borne by women's dresses, into homes, to begin again their work of destruction.

The crusade against spitting, mildly begun by some municipalities, should be carried forward with vigor by this and every health board in the country. When we reflect that nearly every case of consumption, pneumonia, diphtheria, influenza, or catarrh came from the sputa or nasal discharges of some previous case, and that these diseases, which cause perhaps one-third of all the deaths of human beings, would nearly or quite cease to exist if these discharges were destroyed as soon as ejected, we feel that no effort should be spared to make the knowledge of this fact

general. Is this board doing all it can in this direction? Would a leaflet from it, treating generally upon the evils of spitting, except into proper receptacles where the sputa may be promptly destroyed or disinfected, pointing out how this may be done and the danger from its neglect, be of value? I will leave this for your consideration.

To more properly fulfill that requirement of the law of 1895, which makes it incumbent upon this board to furnish data to teachers in the public schools of the State showing how the most dangerous diseases are spread and how they may be restricted, this board commenced a year ago the publication of a monthly 'Teachers' Bulletin. This bulletin is valuable not only for teachers, but it has proven an admirable medium for the transmission of sanitary knowledge to health officers and others. If it is to be continued, and I think it certainly should be, some systematic method for editing it should be adopted. Material for the purpose is sufficiently abundant; but its selection and preparation require both time and judgment. I suggest that at each meeting of this board material be decided upon for the next three months for this bulletin, or that the work be divided between the members of the board for stated periods.

The work upon which we are engaged offers none of the rewards bestowed upon the successful politician or soldier. Comparatively few think of or care for the labor of the sanitarian, yet no other labor is of equal importance. The man who sacrificed his life in probing the foulness of Havana in order that he might devise means for its renovation and thereby save thousands of human lives, exhibited more real courage than many a soldier whose name will appear in history long after that of Waring, the greater hero, is forgotten. The reward of the sanitarian can be only the consciousness that he has done something toward the saving of human life and the relief of human suffering. To such as feel the inspiration of this motive the reward is ample.

As the term, gentlemen, for which you kindly elected me as your presiding officer closes today, it is most pleasant for me to testify to the agreeable relations which have existed between every member of this board and myself during this period, and to the intelligence and high sense of honor and duty you have invariably shown in every official act. I have full faith in the efforts you will continue to put forth in public-health work, and that these efforts will be seconded by the people of the State for whose highest interests they are made. Knowledge of their value is daily growing, and the new century will, I am convinced, record still greater successes for the sanitarian than have been witnessed by even the prolific years which mark those of the century just closing.

GENERAL REPORT OF WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1899.

Much of the work of the office naturally groups itself under three heads—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping is adhered to so far as is practicable without repetition.

COLLECTION AND COMPILATION OF INFORMATION.

Return of names and postoffice addresses of health officers.—There is a local board of health in every township, and in every incorporated city and village in Michigan.

Every local board of health in Michigan is required to appoint and constantly have a health officer, and to report his name and address to the Secretary of the State Board of Health at Lansing.

Blanks for the return of the names and addresses of health officers are sent out by the Secretary of the State Board to the local officers about the first day of April, the law (Sec. 4411, Compiled Laws 1897; Sec. 46, Public Health Laws 1899) requiring the appointment and return to be

made "within thirty days after the annual township meeting in each year."

In the secretary's report of work done during the second quarter of 1899, printed on preceding pages of this volume, is an account of the collection of this information relative to health officers in Michigan in 1899-1900.

In April, 1899, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for the return of names and postoffice addresses of health officers to serve in 1899-1900. The circular and blank forms are similar to those printed on pages xiii-xiv of the report of this Board for 1884. In June, 1899, a second demand was sent to localities from which no return had been made in response to the demand in April. On the outbreak of a dangerous communicable disease in a township, city or village, in which no health officer had been reported, a third and even a fourth demand for the appointment of such officer, and the return of his name has been made; therefore, the number of health officers returned increases until the close of the year for which such officers are appointed. At the close of the fiscal year ending June 31, 1899, the numbers for townships, cities and villages were stated in the quarterly report of this office printed on a preceding page.

Through the systems of reports to the State Board of Health by its corps of correspondents, as well as by the local health officers, and by the systematic searching of the local columns of the country newspapers published in Michigan, the Secretary of the State Board often receives information of an outbreak of a communicable disease, and desires to communicate at once with a health officer; but, if no health officer has been appointed in that locality, or no return of such appointment has been made, delay occurs, and before the secretary can get into correspondence with the delinquent local board of health and a health officer can be chosen, the disease may spread widely within or without the limits of a village or township, with unnecessary sickness and loss of life. It should be said, however, that there is an increasing tendency to comply with this law, and local boards now generally act promptly and coöperate cordially with the State Board in its endeavors to prevent the spread of dangerous communicable diseases.

Special reports relative to dangerous communicable diseases.—Every health officer is supplied with blanks "L" from this office, for reporting outbreaks of diphtheria, scarlet fever, typhoid fever, smallpox, measles, etc. (dangerous communicable diseases), to the secretary of the State Board as required by law. A special blank [S.] for reporting outbreaks of consumption is also supplied local health officers.

Upon the receipt of the report of an outbreak of such disease, blanks [M.] for weekly reports so long as the outbreak lasts, are sent, with a circular letter ("Blue Letter"), also a number of pamphlets containing instructions for the suppression of the disease. These pamphlets are to be distributed to the neighbors of the family in which the disease is, in order to educate them to the importance of their duty under the law, and to secure their coöperation with the health officer.

About 4,768 outbreaks of such diseases were thus attended to during the fiscal year.

Later, a blank is sent to the health officer of each such jurisdiction for a final report at the close of the outbreak, stating just what was done for the restriction of the disease, and with what result—the number of cases and deaths, households invaded, what disinfectants were used, what exceptions, and other facts supplying data for guidance of future efforts.

The facts thus collected are compiled for publication in the annual report of the Secretary of the State Board of Health. In this annual report will be found the report of such facts relative to the dangerous communicable diseases in Michigan in the year 1898.

Annual reports by health officers for the year ending December 31, 1898.—In January, 1899, a circular [218] was sent to the health officer of each township, city and village in the State, about 1,585 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular [65] which is printed on pages viii-ix of the report for 1884. Blank form [I] for reports of health officers, is printed in former reports. With the circular [218] was also transmitted a blank for a copy of a record of diseases dangerous to the public health, similar to the blank which is printed on page 271 of the report for 1882.

Where the name of the health officer has not been returned the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city or township.

In case this failed to secure the return in accordance with the State law, the aid of the prosecuting attorney was requested. This has had the effect of securing a more complete return of reports of health officers.

Annual reports by clerks of local boards of health discontinued.—Since the change of the law (Secs. 4452 and 4453, Compiled Laws 1897; Secs. 87 and 88, Public Health Laws 1899), went into effect, reports of cases of "diseases dangerous to the public health" are not made by the clerk; and, unless it has been impracticable to secure a satisfactory report from the health officer, no demand was made upon the clerk for an annual report.

Return of names of medical practitioners discontinued.—Section 3, Act No. 167, Laws of 1883, as amended by Act No. 268, Laws of 1887 (Sec. 5281, Compiled Laws 1897), provides that:

"It shall be the duty of the supervisor, at the time of making the annual assessment in each year, to make out a list of all the physicians and each student practicing under the instruction of a preceptor residing within his township, village, ward, or city, with the name, age, sex and color of each and the length of time each has been engaged in practice, and if a graduate of a regularly established and reputable college, the name of the college and the date of graduation. Such list shall be returned by the supervisor to the township, village or city clerk, and by the clerk recorded in the book in which are kept the records of the local board of health, and annually on or before the first day of January such clerks shall furnish certified lists of the same to the Secretary of the State Board of Health."

The State Board of Health has regularly, about April 1 in each year, sent blanks for the return of names of medical practitioners to supervisors in Michigan to make it convenient for them to comply with the law. At the close of the year there were sent to the clerks of all townships, cities and villages, blanks on which to report to the State Board of Health the list of physicians returned by the supervisors. Notwithstanding this effort, the returns have never been complete, in fact they were so incomplete that in 1896 the effort to collect these lists was abandoned.

The change in the law requiring all dangerous diseases to be reported

to the health officer was another reason for discontinuing the effort to secure from clerks the return of the names of medical practitioners.

Meteorological reports.—A list of meteorological observers for the calendar year 1898, with a statement of what registers were received from each, is printed in this report. The reports are summarized in an article in this report on "The Principal Meteorological Conditions in Michigan in 1898," commencing on page 1 of Part II. The data are of great value for the purposes of studying the causes of diseases. The observations made at the office of the Board at Lansing, have been summarized weekly, and a copy placed on file in the office.

DISSEMINATION OF INFORMATION.

Published list of names and addresses of health officers.—The names and addresses of 1,488 health officers in Michigan, to serve in 1899-1900, were collected and recorded in the office, and a list will probably be printed in pamphlet form.

Distribution of information how to prevent and restrict dangerous diseases.—Whenever information was received of the first occurrence of diphtheria, scarlet fever, typhoid fever or typho-malarial fever, measles, whooping-cough, consumption, or smallpox, copies of a document on the restriction and prevention of the disease reported were immediately sent to the health officer, with a request that he distribute them where they will be likely to be read, and it was suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger, and it was thought that after reading them they will be most likely to coöperate with the local health officer for the restriction of the disease. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board of Health in this manner, in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from consumption, scarlet fever, and diphtheria, these being the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diphtheria, scarlet fever, and smallpox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish and Danish-Norwegian, translations of a leaflet [47] on contagious diseases have been made into each of these languages, and copies are sent to local boards of health when requested.

A record is kept of reports received, and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information. A compilation of such information relative to the most important diseases is published in this volume.

Printing and distribution of the secretary's annual report.—Comparatively few copies of the annual report of the secretary are published; the whole number is not so large as the number of officers and members of local boards of health in Michigan. In accordance with the provisions of Section 10, Act No. 44, Laws of 1899 (Sec. 14, Public Health Laws 1899), only 4,000 copies of the annual report are published, 2,000 copies less than have ordinarily been published, but about the same number of copies is

allowed for distribution by the Secretary of the State Board of Health (about 3,800). Prior to the passage of Act No. 44, Laws of 1899, many of the reports were practically wasted, being sent to county clerks, from whose offices they were taken only as waste paper. Under the present act, however, it is believed that the reports will be placed to more advantage, and, although it is believed that there is not a sufficient number of copies for distribution by the Secretary of the Board, still it is true that for the number published, they will be more advantageously distributed. These reports are used in exchange with sanitary journals, with other State Boards of Health, with city boards of health in other States, and with health officials in other countries, with libraries, and are sent to physicians in Michigan who contribute to the work of the State Board, and to persons who request copies of the report. Michigan is a populous and prosperous State, largely because of the healthful conditions here, and it is believed that it is made richer, not poorer, by the influence exerted by the publications of the Michigan State Board of Health.

The section of the act which provides for the printing of the secretary's annual report, Sec. 10, Act No. 44, Laws of 1899 (Sec. 14, Public Health Laws 1899), is printed on a succeeding page under the heading "Public Health Legislation," etc., "Laws enacted in 1899," etc.

Instructions to newly appointed health officers.—As fast as the names and addresses of health officers to serve in 1898-1899 were received, a copy of the Bulletin* [120] detailing the duties of health officers, was sent to each one who had not served during the preceding year, together with blanks "L" and "M" for the prompt report of any dangerous communicable diseases, and sample copies of pamphlets on the restriction and prevention of diphtheria, scarlet fever, typhoid fever, measles, whooping-cough, and consumption; also a slip (224) relative to consumption being a dangerous communicable disease, and a short statement relative to its restriction and prevention; a leaflet (226) on the modes of spreading and the best methods for the Restriction and Prevention of Dangerous Communicable Diseases; several leaflet diagrams exhibiting the experience in Michigan, showing the results for recent years in the restriction of diphtheria, scarlet fever, typhoid fever, measles and consumption, and two diagrams showing a comparison between the numbers of deaths from typhoid fever in sewered and unsewered localities, were sent to the newly appointed health officer. The pamphlet containing the laws relating to the public health which were in force in Michigan in 1890 was so nearly out of print that it was not sent except in exceptional cases. A new compilation of the public-health laws is expected to be printed and sent where most needed in 1899.

Reprints.—Reprints of articles in the report and in proceedings of sanitary conventions, have been made in pamphlet form, and sent in answer to queries in letters, that can be best answered in that manner.

Instructions to local officials by telephone, telegraph, etc.—There are in Michigan about four thousand five hundred officers of local boards of health (presidents, clerks, and health officers), many of whom are newly appointed each year, and coming to the work for the first time, need to

*Published under Sec. 15, Act 44, Laws of 1899.

ask many questions in order to be best prepared to serve the people in their several localities. As fast as emergencies arise such questions are replied to by telephone, telegraph, letters, or otherwise as the occasion demands. This is one of the important functions of the central office, of the secretary and executive officer of the State Board.

Diagrams of instructive experience in Michigan.—Diagrams showing the favorable results of isolation and disinfection of diphtheria, typhoid fever, scarlet fever, smallpox, and the generally favorable results of isolation and disinfection, lives saved by public health work in Michigan, deaths from typhoid fever in sewered and unsewered localities, have been printed and largely distributed. The evidence relative to the effect of isolation and disinfection as a preventive of the dangerous communicable diseases, gains strength as shown by the diagrams for each succeeding year, and comparisons with periods of years. The diagrams prove that in those localities in which isolation and disinfection of diphtheria and scarlet fever were enforced, only about one-fifth as many deaths occur as in those localities where isolation and disinfection are neglected. The diagrams relative to other diseases show a greater or less proportion of life-saving through isolation and disinfection.

During previous years a more detailed summary of the pamphlets, maps and diagrams printed and distributed by the State Board of Health has been given in the secretary's annual report; but it will now be possible to briefly mention only the most important of them.

The pamphlet (529), *Public-Health Work in Michigan*, by Dr. Reynolds, Health Commissioner of Chicago, was printed and distributed.

The following diagrams: "Low water in wells and sickness from typhoid fever in Michigan during the years 1878, 1880-92," three diagrams showing a comparison between the sickness from typhoid fever in cities possessing complete sewer systems, and those having none, "Isolation and disinfection restrict typhoid fever, 1890-96," "Lives saved by public-health work in Michigan," "Consumption, 1869-96," "Scarlet fever, 1868-91," "Typhoid fever, 1868-94," "Smallpox, 1869-94," were printed and distributed during the year.

The sixth edition of the pamphlet (226), "Dangerous Communicable Diseases, how Spread, how Restricted" was printed and distributed. The Teachers' Sanitary Bulletin, numbers 3 to 14 inclusive, have also been printed and distributed.

Pamphlet 524, "A Quarter Century of Public-Health Work in Michigan," was printed in connection with the Quarter Centennial Celebration of the establishment of the Michigan State Board of Health, and widely distributed.

Official Directory of Michigan Summer and Health Resorts.—In compliance with a concurrent resolution of the Michigan legislature of 1897, there was prepared and published by this Board an official directory of summer and health resorts in this State under the title, "Michigan a Summer and Health Resort State," Reprint No. 523. During the fiscal year 2,027 copies of this reprint were sent to the editors of leading newspapers in the States to the Southward of Michigan, and about 1,916 copies to distinguished sanitarians throughout the United States, the editors of newspapers in this State, the proprietor, manager or other person particularly interested in a summer resort, mineral spring or sanitarium in

this State, railroad officials, persons furnishing information or plates, and others who made application for the publication. A considerable number of copies were handed out to persons who wished to mail them to persons outside the State.

The pamphlet reprints from the annual report relative to Scarlet Fever (514), Typhoid Fever (521), Diphtheria (513), Consumption (520), Measles (518), and Smallpox (526), in Michigan in 1896, were printed and distributed, as well as the pamphlet reprints on Tuberculosis in Cattle (531), Accidents from the use of Gasoline and Kerosene (532), and Nuisances in Michigan in 1896 (533). All of which were sent to localities and under circumstances which promised the most profitable results from their distribution.

Ten thousand copies of each of the following pamphlets were printed and have been largely distributed as occasion has demanded: Restriction and Prevention of Measles (171), Restriction and Prevention of Diphtheria (106), Restriction and Prevention of Whooping-Cough (229), Restriction and Prevention of Consumption (175), Restriction and Prevention of Typhoid Fever (124).

A Summary of the Communicable Diseases in Michigan in 1896 (512), was reprinted from the annual report of the secretary for 1897, and 1,000 were distributed. Two thousand copies of the report of the Proceedings of the Sanitary Convention at Traverse City were printed and generally distributed.

Other pamphlets, among which were the reports of the conditions of health in Michigan for the months of January to May, 1899, the small leaflet relative to the "Resuscitation of the Drowned, Suffocated, or Electrically Shocked," the biennial report of the State Board of Health to the outgoing and incoming governors, the weekly report of diseases to the State Board of Health, and the general report of work done by health officers and local boards of health in Michigan [120], were printed and distributed.

Data and statements supplied to school superintendents and teachers, in compliance with act No. 146, laws of 1895.—During the fiscal year, 137,703 copies of Teachers' Sanitary Bulletins, Nos. 3 to 14, inclusive; 11,815 copies of Circular No. 226, "Dangerous Communicable Diseases, How Spread, How Restricted and Prevented," and 775 school sets, consisting of all the small documents and some of the diagrams published by this Board, relative to the prevention and restriction of the dangerous communicable diseases, were sent to those superintendents and teachers of schools whose names had been returned to this office.

Immigrants possibly exposed to communicable diseases, destined to settle in Michigan.—During the year six notices were received from the U. S. Commissioner of Immigrants at New York City, that smallpox, diphtheria and measles had occurred on board steamships arriving at that port, and giving the names and destinations of immigrants on board those steamships intending to settle in Michigan; one such notice was received from the U. S. Commissioner of Immigrants at Philadelphia, that typhoid fever had occurred on board one steamship arriving at that port; and one each such notices were received from the surgeons of the steamships Lake Huron and Californian, that measles and chicken-pox, respectively, had occurred on board prior to the arrival of those vessels at Canadian ports.

Copies of these notices, including the lists of the names of the immigrants, were promptly forwarded to the health officers of the numerous localities in Michigan to which the immigrants were destined.

The purpose of this action is to aid local health officers in preventing outbreaks of dangerous communicable diseases, and as a matter of fact, in recent years while these measures have been in use, very few outbreaks of disease have been traced to immigrants.

Publication of proceedings of meetings of the State Board of Health.—Abstracts and brief accounts of the proceedings of meetings of the State Board are prepared, hektographed or printed, and distributed as soon as practicable after each meeting. Abstracts of the minutes of meetings have, in former years, been printed in Part I of the secretary's annual report, but this year, and possibly in the future, they will be omitted from the report on account of the restriction of the size of the volume; but a record will be kept on file in the office of the secretary. The distribution of these abstracts is not the same for all meetings, being to different classes of persons, according to the nature of the contents, as the action of the board, or its deliberations may be appropriate. In some instances they are sent to sanitary and medical journals, in others to teachers, health officers and others, and in some, to the members of boards of control of the different State institutions.

Secretary's quarterly reports of work in the office.—At the close of each quarter, the secretary prepares a brief report of the work done in the office. This report is presented, and portions of it sometimes read at the next regular meeting; and, if the abstract of the proceedings of the meeting is printed, this report is printed in the same pamphlet. Without a study of these quarterly reports, no person can have a clear idea of what is being done by the health service of the State.

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING JUNE 30, 1899.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN—In compliance with Section 5 of Article II of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the Board, which has been received, issued, expended, and destroyed since the last report, and of property remaining on hand, and also in whose care each item of property is intrusted." is respectfully submitted.

Preceding reports should enable one to learn the items of property on hand at the beginning of the fiscal year 1899. My last report is printed on pages cvi-cviii of the annual report for 1898. Since last report, instruments and articles of a similar nature have been purchased as follows:

Photo-Engraved Plates Purchased.

Twenty-four plates to illustrate the pamphlet, "The State Board of Health, and a Quarter Century of Public Health Work in Michigan, 1873-1898."

Two plates—Michigan State Board of Health Seal.

One plate—Locations of Summer and Health Resorts. Reported to the State Board of Health.

One plate—Great Seal of the State of Michigan.

One plate—To illustrate a paper on Water Supply, at Tawas City, Mich.

One plate—Deaths in Michigan, 10 years, 1887-96. Consumption, Pneumonia, Diphtheria, Typhoid Fever, Scarlet Fever, Measles, Whooping-Cough, and Smallpox.

REPORT OF SECRETARY RELATIVE TO PROPERTY. xxix

Fifteen plates relating to the Meteorological Conditions in Michigan in 1897.
 One plate—Movements of Contagium of Diphtheria in 1897.
 One plate—Isolation and Disinfection restricted Scarlet Fever in 1897.
 One plate—Movements of Contagium of Scarlet Fever in 1897.
 One plate—Distribution of Scarlet Fever reported in Michigan in 1897.
 One plate—Distribution of Typhoid Fever reported in Michigan in 1897.
 One plate—Distribution of Diphtheria reported in Michigan in 1897.
 One plate—Movements of Contagium of Typhoid Fever in 1897.
 One plate—Distribution of Measles reported in Michigan in 1897.
 One plate—Isolation and Disinfection restricted Diphtheria in Michigan during the 10 years, 1887-96.

Property Loaned.

Many photo-engraved plates were loaned to the Robert Smith Printing Co., State Printers and Binders, Lansing, to be used in printing annual reports and other publications of this Board. Most of these plates have been returned, but a few still remain charged to them on the property book of this office. The plates will probably be returned as soon as the State Printer is through with them.

No Instruments Were Purchased Since Last Report.

Meteorological Instruments Issued.

One barometer, and box for protection, one dry-bulb thermometer, one wet-bulb thermometer, boards, clips, cup and wick, one maximum and one minimum registering thermometers, with boards, etc., for hanging. One galvanized iron raingauge, with measuring stick, were sent to John A. Harrison, Conklin, Michigan.
 One maximum registering thermometer to E. S. Pettyjohn, M. D., Alma Sanitarium, Alma, Michigan.

Meteorological Instruments Returned.

One barometer, and box for protection, by John A. Harrison, Conklin, Michigan.

Meteorological Instruments Accidentally Broken While in Use by Observers.

One maximum registering thermometer by the observer at Alma.
 One barometer, in transit, at Conklin, by Express Co.
 One minimum registering thermometer, in this office, while expelling air bubble from tube with hot water.

Meteorological Instruments and Other Property on Hand.

The meteorological instruments, etc., on hand, are the same as accounted for on pages cvi-cviii of the annual report for 1898, except the articles issued and broken during the year as shown above.

Accessions to the library.—In all previous years there have been published in the annual reports the accessions to the library by gift, exchange, or purchase, during the fiscal year. It is omitted from this report because of lack of space, the law (Act 44, Laws of 1899) limiting the size of this volume.

Loans from the library.—The "Library Loan Book" is a permanent record of the office, and a complete record of the loan and return of books belonging to the library is kept in that book. The books remaining loaned at the end of the fiscal year appear in that book, but are not published for lack of space.

Postage money on hand at beginning of fiscal year (July 1, 1898) \$86.59. Vouchers for postage (for use in the office) have been allowed during the year to the amount of \$1,386.39. Postage money on hand at end of fiscal year (June 30, 1899) was \$40.40. The cost of postage during the fiscal year ending June 30, 1899, was \$1,622.19, as follows:

Distribution of annual reports.....	\$291 19
Distribution of small pamphlets and circulars	472 35
Sending weekly and monthly bulletins	45 37
Collection and dissemination of information in regard to communicable and other diseases	309 23
Sending announcements and programs for sanitary conventions.....	2 59
Sending meteorological material to observers.....	7 45
Work in connection with the collection of sickness statistics.....	134 41
Securing annual reports from health officers and clerks.....	26 11
Securing name and postoffice address of health officers.....	25 85
Distribution of school literature to teachers and others.....	53 96
Distribution of Teachers' Sanitary Bulletins (pound rate of postage).....	110 28
Regular and special correspondence of the office, postal cards, and all other postage (including a considerable amount for distribution of documents with the restriction of diphtheria, scarlet fever, smallpox, etc., to localities where those diseases occurred)	143 40
	<hr/> \$1,622 19

There are now on hand 3,700 sheets of hard paper of half letter size. There were about 178,103 envelopes on hand at the time of making the last report; 141,300 of the various kinds used in the office have been purchased since, making a total of 319,403. There are now on hand 64,675 printed envelopes, and 106,510 blank envelopes, making a total of 171,185. About 148,218 have been used in the work of the office.

XXX STATE BOARD OF HEALTH—REPORT OF SECRETARY, 1899.

The following table shows the amount and kind of paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand.

Kind of paper.	On hand at last report.		Purchased since last report.		Used during the fiscal year.		On hand June 30, 1899.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat.....	5	130				330	4	280
Crown.....	6	226			5	61	1	165
Folio post.....	17	160	30		31	112	16	48
B. Hornet (linen).....	2	380			1	20	1	360
Demy.....	5	51			1	346	3	185
Medium.....	3	75				365	2	190
Imperial.....	1						1	
Byron Weston.....		124						124
Whitefriar's No. 4 (light blue).....			1		1			
Letter heads, office (linen).....		6,100		4,000		6,600		3,500
Letter heads, members (linen).....		1,000		1,000		1,100		900
Foolscap.....	1	240					1	224
Legal cap.....	1					12		468
Blotting paper.....		200		240		210		230
Blue cover paper.....	2		4		2	160	3	320
Postoffice paper.....	1	200					1	200
Book paper, S. S. C. white.....	1	31				16	1	15
Manilla.....	1	375	3	200	1	167	3	408

TOTAL AMOUNT AND CLASSIFICATIONS OF EXPENDITURES (UNDER ACTS 81, 1873, AND 241, 1881) BY THE STATE BOARD OF HEALTH, AS PER VOUCHERS 2942-3037, EXCEPT 3032, INCLUSIVE, ALLOWED DURING THE FISCAL YEAR ENDING JUNE 30, 1899.

Drawing, Engraving, etc.	\$57 50
Expenses of Members:—	
Attending Meetings	257 07
Other Official	27 15
Instruments and books	116 17
Paper, Stationery, etc.....	157 41
Postage:—	
Office	1,316 79
Members	25
Printing and Binding	406 83
Secretary	3,000 00
Expressage	320 75
Telegrams	6 52
Telephone and messages	7 95
Miscellaneous	68 34
Special investigations .....	.....
	<hr/>
	\$5,742 73

TOTAL AMOUNT AND CLASSIFICATIONS OF EXPENDITURES UNDER ACT 142,
1897, BY THE STATE BOARD OF HEALTH, AS PER VOUCHERS 29-71,
INCLUSIVE, ALLOWED DURING THE FISCAL YEAR
ENDING JUNE 30, 1899.

Drawing, Engraving, etc.	\$0 55
Expenses of Members:—	
Attending Meetings	30 82
Other Official	115 75
Instruments and books	355 19
Paper, Stationery, etc.	
Postage:—	
Office	600 00
Members	
Printing and binding	1,026 78
Expressage	24 97
Telegrams	3 45
Telephones	15 55
Miscellaneous	5 98
	<hr/>
	\$2,179 04

EXPENDITURES BY THE STATE BOARD OF HEALTH IN THE CALENDAR
YEAR, 1898.

The foregoing is reported, in compliance with law, relative to the fiscal year. But the appropriations of the Board are for the calendar year, and they amount to eight thousand five hundred dollars. The expenditures for any calendar year, therefore, cannot exceed eight thousand five hundred dollars. The following is a classified statement of expenditures for the calendar year 1898.

CLASSIFIED STATEMENT OF EXPENDITURES (UNDER ACTS 81, 1873, AND 241,
1881) BY THE BOARD DURING THE CALENDAR YEAR, 1898, AS PER
VOUCHERS NOS. 2858-2863, 2867-2871, AND 2873-3001. INCLUSIVE.

Chemical Analyses	\$1 38
Engraving, Drawing, etc.	57 50
Expenses of Members:—	
Attending Meetings	309 02
Other Official	107 95
Instruments and books	201 68
Paper, Stationery, etc.	250 04
Postage:—	
Office	782 35
Members	45
Printing and Binding	599 51
Secretary	3,000 00
Special investigations	25 44
Expressage	551 26
Telegrams	9 08
Telephone	20 48
Miscellaneous	83 86
	<hr/>
	\$6,000 00

CLASSIFIED STATEMENT OF EXPENDITURES UNDER ACT 142, 1897, BY THE
BOARD DURING THE CALENDAR YEAR, 1898, AS PER VOUCHERS
NOS. 15-63, INCLUSIVE, EXCEPT 62.

Engraving, Drawing, etc.	\$0 55
Expenses of Members:—	
Attending Meetings	30 82
Other Official	
Instruments and books	112 60
Paper, Stationery, etc.	322 78
Postage:—	
Office	800 00
Members	
Printing and Binding	1,119 19
Expressage	26 77
Telegrams	3 45
Telephone	5 55
Miscellaneous	5 98
	<hr/>
	\$2,427 69

EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations (\$8,500) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the

expenses in the examination of plans for public buildings; these expenditures *on account of* but not by the Board are provided for by other acts of the legislature than those appropriating money to be expended by the Board, and the accounts are kept in other offices; not in the office of the State Board of Health; the accounts for clerk hire are kept by the Auditor General, and are reported in his annual report; the accounts for publication of the annual report of this Board, and for expenses in the examination of plans for public buildings, are kept by the Board of State Auditors, and are published in the annual report of that Board.

Respectfully submitted,

HENRY B. BAKER,
Secretary.

ABSTRACTS FROM THE QUARTERLY REPORTS OF WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH, AND OF THE CONDITION OF HEALTH IN MICHIGAN, DURING THE FISCAL YEAR ENDING JUNE 30, 1899.

For each regular meeting of the State Board of Health, the secretary prepares a report of work in the office, and of the condition of health in Michigan, during the preceding quarter. For years past these quarterly reports have been printed under this heading in the annual report; but, because of the new law mentioned on the first pages of this volume, and printed further on, it seems necessary to omit printing them. They still continue to be made and placed on file in the office of the secretary.

A summary of a few portions of the quarterly reports during the fiscal year ending June 30, 1899, is as follows:

Dangerous communicable diseases.—The number of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding number concerning which action was taken by this office, in the fiscal year ending June 30, 1899, are as follows: Of diphtheria, 450; of scarlet fever, 542; of typhoid and typho-malarial fever, 865; of measles, 471; of whooping-cough, 312; of smallpox, 18; of consumption, 1,794; and of meningitis, 317. Total, for the eight diseases, 4,769.

The number of communications relative to dangerous communicable diseases received and placed on file, was 16,760.

Relative to dangerous communicable diseases, letters, written cards, and demands for weekly and final reports on cards, or in the form of the circular letter, were sent out to the number of 17,086.

The "final" reports of outbreaks received and filed, were, for diphtheria, 365; for scarlet fever, 443; for typhoid and typho-malarial fever, 605; for measles, 401; for whooping-cough, 170; for smallpox, 11; for consumption, 2,055; and for meningitis, 172. Total, for the eight diseases, 4,222.

The Monthly Bulletin of Vital Statistics issued by the State Department, has resulted in giving this office the first information of the occurrence of 89 deaths from diphtheria and croup; 24 deaths from scarlet fever; 294 deaths from typhoid and typho-malarial fever; 34 deaths from measles; 162 deaths from whooping-cough; 1,393 deaths from consumption, and 254 deaths from meningitis. A total, for the seven diseases, of 2,250.

The local columns of 7,113 newspapers have been looked over for reports of the occurrence of communicable diseases. (This work is done by

the clerk who acts as messenger and janitor, in the intervals of his performance of other duties.) This has resulted in giving this office first information of the alleged occurrence of 13 outbreaks of diphtheria; 16 outbreaks of scarlet fever; 45 outbreaks of typhoid and typho-malarial fever; 28 outbreaks of measles; 12 outbreaks of whooping-cough; 43 cases of consumption, and 2 cases of meningitis. A total for the seven diseases of 159. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table:

TABLE 1.—FISCAL YEAR ENDING JUNE 30, 1899.—*Exhibiting the number of outbreaks of Diphtheria, Scarlet Fever, Typhoid Fever, Measles, Whooping-cough, Smallpox, Consumption and Meningitis, from July 1, 1898, to June 30, 1899, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, first information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of reports which were denied by the health officer; and the per cent relative to which no reply was received from the health officer.*

	Reports from all sources, July 1, 1898, to June 30, 1899.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to no notice sent from this office.
Diphtheria.....	* 450	3	31	31	38
Scarlet Fever.....	* 542	3	19	25	56
Typhoid Fever	* 865	5	45	13	42
Measles.....	* 471	6	53	11	36
Whooping-cough.....	* 312	4	50	17	33
Smallpox.....	* 18	0	0	0	0
Consumption.....	* 1,794	2	35	16	49
Meningitis.....	* 317	1	50	0	50
Averages for the 8 diseases.....		3	40	16	44

*The numbers of outbreaks given in this table do not necessarily agree with the numbers given in tables in another part of the volume including the annual report, for the reason that this table is for the fiscal year, and the other tables are for the calendar year and also for the reason that all alleged outbreaks, of which information was obtained from the newspapers and other sources are included in this table. If the health officers denied that such outbreaks occurred, or if they make no response to the letters sent from this office, relative to newspaper reports, such alleged outbreaks are not included in the compilation of that disease.

While considerable work was done relative to meningitis during the quarter ending March 31, 1899, yet the work was such that it is not included in the above table, and only one quarterly report, that for the quarter ending June 30, 1899, is included in this summary.

For the purpose of facilitating the proper action for the restriction of the "diseases dangerous to the public health" and to make it possible to compile the important "contagious disease statistics" a record is kept of facts concerning every outbreak of a "disease dangerous to the public

health," upon which action is taken by this office, and also of every important communication relating thereto received or sent out. This required over 33,800 entries to be made in the "Record Books," one of which books is kept for each dangerous communicable disease.

Work in connection with sickness statistics.—When a return of the name of a new health officer was received, a printed circular [81.] demanding the weekly card reports of sickness, and a hektographed circular letter describing the plan of making the card reports, together with supplies for making the reports, were sent to the health officer of each city and village. During the fiscal year ending June 30, 1899, 7,882 blank report, receipt and return postal cards, 569 weekly record books, and 847 printed, hektographed and typewritten letters, were mailed to health officers of cities and villages, and voluntary correspondents, all of whom were understood to be physicians in active general practice of medicine. About 5,334 weekly postal card reports were received and entered on the register.

The sickness statistics of Michigan, based upon these weekly card reports, are probably the most important sickness statistics in the world, and are made especially useful for the purpose of studying the climatic causation of diseases, by reason of the excellent meteorological statistics which have been collected for a long series of years. The general plan of the weekly card reports, the sickness statistics obtained from the compilation of the weekly card reports received during the year 1898, and the data obtained from the meteorological observations during the year 1898, may be found on pages 1 to 104 of this report. The weekly and monthly bulletins of "Health in Michigan" are mentioned on pages 60-61.

An ephemeral use is made of the data contained in the weekly card reports, and of the meteorological observations at Lansing, by the publication of weekly, monthly and quarterly bulletins, "Health in Michigan." Samples of the several bulletins may be found on page 85, report for 1891, pages lxxix and xcii-xciii, report for 1894, and pages lxxxvi-lxxxvii report for 1898. During the fiscal year ending June 30, 1899, about 59 copies of the weekly bulletin were mailed each week, and about 120 copies of the monthly bulletin were mailed each month, to members of the State Board of Health and other officials and persons interested in keeping a "finger on the public pulse," also to a number of newspapers and sanitary and medical journals.

Meteorology at one central station, and sickness throughout Michigan from all causes, during the fiscal year ending June 30, 1899, compared with the preceding fiscal year.—A comparison of meteorological conditions, at Lansing, in the fiscal year ending June 30, 1899, with the meteorological conditions in the preceding fiscal year, shows that in 1899, the prevailing direction of the wind was southwest instead of northwest, the velocity slightly greater, the average temperature slightly lower, the average daily range of temperature slightly less, the average daily range of atmospheric pressure slightly greater, the rainfall and the absolute humidity slightly less, the relative humidity the same, the day and night ozone more, and the depth of water in the observation well six inches less.

Compared with the preceding fiscal year, the reports from all sources indicate an increased prevalence in the sickness from scarlet fever, typhoid fever, whooping-cough and smallpox, and a decreased prevalence

of consumption, diphtheria and measles, in the fiscal year ending June 30, 1899.

The weather and the health in Michigan, in the fiscal year ending June 30, 1899, compared with the average for corresponding ten years, 1889-1898.—A comparison of meteorological conditions, at Lansing, of the fiscal year ending June 30, 1899, with the average for the corresponding ten years, 1889-1898, shows that in 1899, the prevailing direction of the wind was the same (southwest), the velocity slightly less, the average temperature slightly higher, the average daily range of temperature, the average daily range of atmospheric pressure and the rainfall slightly less, the absolute humidity more, the relative humidity and the day and night ozone less, and the depth of water in the observation well six inches less.

Compared with the average in the corresponding ten years, 1889-1898, the reports from regular observers indicate that no disease was more prevalent than usual, and that consumption, diphtheria, erysipelas, intermittent fever, remittent fever and whooping-cough were less prevalent than usual in the fiscal year ending June 30, 1899.

[PART II.]

PRINCIPAL METEOROLOGICAL CONDITIONS
IN MICHIGAN IN 1898.

COMPARISONS OF CONDITIONS IN 1898 WITH THOSE IN PRECEDING
YEARS.

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF
HEALTH AND FOR THE UNITED STATES WEATHER BUREAU.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH.

In the annual reports of this Board, there has been published for each of the years 1877 to 1897, inclusive, a summary relative to the principal meteorological conditions observed during the year. This paper continues the subject for the year 1898. The names of the observers for that year, and the months in that year for which copies of registers of meteorological conditions were received from each, are stated in Exhibit 1. In Exhibit 2, is given the latitude, longitude, and elevation of each of these stations. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature, relative and absolute humidity of the air, cloudiness, fogs, rainfall, ground-water levels, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only the meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the annual report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the annual report for 1887, in an article on "The Causation of the Cold-Weather Diseases," influenza, tonsillitis, bronchitis,

scarlet fever, diphtheria, and smallpox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness statistics is made in the report for 1887, in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages." In the report for 1891, "Abstract of Proceedings, April 14, 1891," in a discussion on the subject of "The Causation of Influenza," is an important use of the meteorological data, with diagrams and other evidence, showing how closely influenza is associated with atmospheric temperature, humidity, ozone, and wind. In the report for 1891, page cxxvii, is an article entitled "Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages in Colorado," in which are also data relative to other states and countries. In the report for 1894, pages clix-ccxiv, is a paper on "The Causation of Influenza and Allied Diseases with Suggestions for their Prevention," in which important use is made of the meteorological data collected in Michigan since 1877. In each of the annual reports of this Board since that for the year 1877, considerable use has been made of the sickness statistics in Michigan for the complete study of which, data of the meteorological conditions coincident with the sickness is required.

EXHIBIT 1.—*Names of observers whose reports are summarized in the following meteorological tables and diagrams, their places of observation, and the counties and geographical divisions of the State in which these places are situated, and months for which reports were received from each observer.*

Name of observer.	Place of observation.	County.	Division of the State.*	Months (inclusive) for which registers were received.
W. C. Gates, M. D. Henry R. Patrick, Observer. U. S. Weather Bureau.	Rockland.....	Ontonagon ..	U. P.	January to December.
C. L. Bozzell, Observer. U. S. Weather Bureau.....	Marquette.....	Marquette.....	U. P.	January to December.
S. E. Wait.....	Sault Ste. Marie.....	Chippewa.....	U. P.	January to December.
H. McP. Baldwin, Observer. U. S. Weather Bureau.....	Traverse City.....	G'd Traverse.	N. W.	January to December.
D. W. Mitchell, M. D. Geo. W. Felger, Observer, U. S. Weather Bureau.....	Alpena.....	Alpena.....	N. E.	Jan., Feb. to Nov., Dec.
R. Q. Grant, Observer, U. S. Weather Bureau.....	Harrisville.....	Alcona.....	N. E.	January to December.
John S. Caulkins, M. D.	Grand Haven.....	Ottawa.....	W.	January to December.
Prof. R. C. Kedzie.....	Port Huron.....	St. Clair.....	B. & E.	January to December.
E. S. Pettyjohn, M. D.	Thornville.....	St. Clair.....	B. & E.	January to December.
Thos. S. Ainge.....	Agri College.....	Lapeer.....	B. & E.	January to December.
Asaph Hall, Jr., Director, Detroit Observatory.....	Alma.....	Ingham.....	C.	January to December.
J. H. Kellogg, M. D.....	Ann Arbor.....	Gratiot.....	C.	January to December.
Lewis Marvill.....	Battle Creek.....	Ingham.....	C.	January to December.
C. C. Tefft.....	Parkville.....	Washtenaw	S. C.	January to December.
S. Alexander Norman B. Conger, Inspector and L. F. Official, Weather Bureau.....	Battle Creek.....	Calhoun.....	S. C.	Jan., Mar., Apr., Oct. to Dec.
	Parkville.....	St. Joseph.....	S. C.	January to December.
	Tecumseh.....	Lenawee.....	S. C.	Jan. to Aug. and Oct. to Dec.
	Birmingham.....	Oakland.....	S. E.	January to December.
	Detroit.....	Wayne.....	S. E.	January to December.

*The counties in each division are stated in Exhibit I, in preceding reports.

The article in this annual report relative to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

It is believed that there is nowhere else so complete a statement of the facts relating to meteorology of Michigan as is here presented, for any use for which such knowledge may be needed, now or hereafter.

EXHIBIT 2.—*Latitude and longitude, elevation above sea level, and the average temperature and average barometric pressure in 1898, at meteorological stations in Michigan,—the names of the stations being arranged in order by latitude, highest first.*

Localities in order of latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (approximate) above sea level.—Feet.	Height of mercury in cistern of barometer above sea level.—Feet.	Average temperature, 1898. Degrees Fahr.	Average atmospheric pressure, 1898. Inches of mercury corrected for temp.
Rockland.....			1,190.34		41.85	28.656
Marquette.....	46°34'	87°24'	669.			
Sault Ste. Marie.....	46°28'	84°22'	642.			
Alpena.....	45°5'	83°3'	587.			
Traverse City.....	44°45'	85°40'	598.	605.	46.69	29.298
Alma.....	43°42'	87°75'	784.	790.	50.11	29.186
Harrisville.....	43°40'	83°30'	616.		44.82	29.315
Grand Haven.....	43°5'	86°18'	590.			
Port Huron.....	43°0'	82°26'	602.			
Thorntown.....	* 42°55'	* 83°10'	§ 975.	§ 980.	49.03	28.967
Agricultural College.....	42°44'	84°29'	820.	834.	48.17	29.124
Lansing, S. B. of H.....	† 42°44'	† 84°33'	¶ 900.	917.	48.94	29.070
Birmingham.....	42°30'	83°10'	‡ 752.		49.83	29.077
Detroit.....	42°20'	83°3'	585.	730.		
Battle Creek.....	42°20'	85°11'	800.			
Ann Arbor.....	42°17'	83°44'	930.	936.	49.13	29.028
Tecumseh.....	* 42°1'	* 83°57'	835.	840.		

*Estimated from lines on a map of Michigan, issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

†The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42° 43' 53.11" N. and 84° 33' 19.63" W.

‡Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

§Estimated from data in Tackabury's Atlas of the State of Michigan.

¶Estimated from comparisons of the barometrical observations at Lansing, Port Huron, and Grand Haven for the four years, 1879-82.

NOTE.—Green's standard barometer was used at the above stations for the year 1898.

EXHIBIT 3.—Average temperature by year and months, for the year 1898, and the average for the 21 years, 1877-97. These averages are for groups of several stations in Michigan.

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 21 yrs., '77-97.	46.34	21.46	23.41	29.84	44.84	56.21	66.39	70.89	68.07	61.54	49.27	36.17	28.00
1898.....	47.62	25.65	24.47	36.78	43.77	56.91	67.75	72.14	69.43	64.21	50.12	35.47	24.71

EXHIBIT 4.—Average temperature by year and months, for the year 1898, and the average for the 19 years, 1879-97, at the office of the State Board of Health, State Capitol, Lansing, Michigan.

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 yrs., '79-97.	47.32	22.27	24.05	31.29	46.49	58.12	62.12	72.06	68.58	61.88	49.80	36.72	28.52
1898.....	48.94	27.73	25.33	38.87	44.90	58.49	69.76	73.48	70.90	64.52	50.85	35.78	26.67

EXHIBIT 5.—Average temperature by year and months, for the year 1898, and the average for the 34 years, 1864-97, at the Agricultural College, Michigan.

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 34 yrs., '64-97.	46.57	21.87	23.69	30.91	46.01	57.93	67.77	71.40	68.59	60.59	48.18	35.52	26.56
1898.....	48.17	26.21	24.49	37.56	44.37	58.37	69.19	73.01	70.45	63.58	50.43	34.40	25.99

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1898 IN MICHIGAN.

At the several meteorological stations, in different parts of the State, the average temperature for 1898 was 1.28° higher than the average for the preceding 21 years; the annual range of temperature was 5° less than in 1897, and 7° less than the annual range for the preceding 21 years; the average monthly range of temperature was 2° less than in 1897, and 2° less than the average for the preceding 21 years. The average daily range of temperature was $.62^{\circ}$ less than in 1897, and $.82^{\circ}$ less than the average for the preceding 19 years; the average cloudiness was the same as in 1897, and one per cent greater than the average for the preceding 21 years; the rainfall (rain and melted snow) was 1.04 inches greater than in 1897, and 1.26 inches less than the average for the preceding 21 years; the average atmospheric pressure was .007 of an inch greater than in 1897, and .053 of an inch less than the average for the preceding 21 years.

In Exhibit 6, is given by year and months, a comparison of conditions in 1898, in Michigan, with those in 1897, and with the averages of periods of years. Naming the months in order of greatest difference, March, January, September, August, June, July, February, October and May, were months in which the average temperature in 1898 was higher than the average for corresponding months in the preceding 21 years; December, April and November were months in which the average temperature

EXHIBIT 6.—*Statements of meteorological conditions in the year, and in each month of the year 1898, compared with the annual and monthly averages for 1897, and for several stated periods of years. These statements and averages are for groups of several stations in Michigan.*

Meteorological conditions.	1898 Compared with averages for previous years.		In 1898 More (+), or less (—), than in 1897.	Meteorological conditions.	1898 Compared with averages for previous years.		In 1898 More (+), or less (—), than in 1897.
	No. of years aver- aged, end'g with 1897.	More (+), or less (—), in 1898 than the average for previous years.			No. of years aver- aged, end'g with 1897.	More (+), or less (—), in 1898 than the average for previous years.	
YEAR 1898.				YEAR 1898.			
Av. temp.....	21	+1.28°	+1.05°	<i>Continued.</i>			
Range of temp.*.....	21	—7°	—5°	Cloudiness.....	21	+1 per ct.	=
Av. monthly range of temp.*.....	21	—2°	—2°	Rainfall.....	21	—1.26 in.	+1.04 in.
Av. daily range of temp.*.....	19	—82°	—62°	Atmospheric pres- sure.....	21	—0.053 in.	+0.007 in.
JANUARY.				FEBRUARY.			
Av. temp.....	21	+4.19°	+3.25°	Av. temp.....	21	+1.06°	—1.17°
Range of temp.*.....	21	—6°	—9°	Range of temp.*.....	21	—1°	+8°
Av. daily range of temp.*.....	19	—55°	—24°	Av. daily range of temp.*.....	19	—2.60°	+1.53°
Cloudiness.....	21	=	—7 per ct.	Cloudiness.....	21	+13 per ct.	=
Rainfall.....	21	+0.76 in.	—0.55 in.	Rainfall.....	21	+0.09 in.	+1.15 in.
Atmospheric pres- sure.....	21	—0.125 in.	—0.050 in.	Atmospheric pres- sure.....	21	—0.059 in.	+0.022 in.
MARCH.				APRIL.			
Av. temp.....	21	+6.94°	+4.92°	Av. temp.....	21	—1.07°	—0.16°
Range of temp.*.....	21	—6°	—11°	Range of temp.*.....	21	—4°	—4°
Av. daily range of temp.*.....	19	—42°	+20°	Av. daily range of temp.*.....	19	—1.57°	—1.16°
Cloudiness.....	21	=	—5 per ct.	Cloudiness.....	21	—1 per ct.	—9 per ct.
Rainfall.....	21	+1.08 in.	+0.23 in.	Rainfall.....	21	—0.91 in.	—1.07 in.
Atmospheric pres- sure.....	21	+0.019 in.	+0.086 in.	Atmospheric pres- sure.....	21	+0.002 in.	+0.023 in.
MAY.				JUNE.			
Av. temp.....	21	+0.70°	+3.36°	Av. temp.....	21	+1.36°	+4.68°
Range of temp.*.....	21	—12°	—8°	Range of temp.*.....	21	—5°	—8°
Av. daily range of temp.*.....	19	—1.32°	—0.71°	Av. daily range of temp.*.....	19	+0.68°	+0.63°
Cloudiness.....	21	=	—2 per ct.	Cloudiness.....	21	—5 per ct.	—6 per ct.
Rainfall.....	21	—1.15 in.	—1.30 in.	Rainfall.....	21	+0.24 in.	+1.37 in.
Atmospheric pres- sure.....	21	—0.071 in.	—0.014 in.	Atmospheric pres- sure.....	21	—0.026 in.	+0.046 in.

*By registering thermometers.

Comments on Exhibit 6 are printed on pages 4 and 6.

The high temperature for March and the small amount of rainfall for July are especially noticeable.

EXHIBIT. 6—CONTINUED.—*Meteorological conditions at stations in Michigan, in months for the year 1898, compared with averages for corresponding months in preceding years.*

Meteorological conditions.	1898 Compared with averages for previous years.			In 1898 more (+), or less (—), than in 1897.	Meteorological conditions.	1898 Compared with averages for previous years.			In 1898 more (+), or less (—), than in 1897.
	No. of years aver- aged, end'g with 1897.	More (+), or less (—), in 1898 than the average for previous years.				No. of years aver- aged, end'g with 1897.	More (+), or less (—), in 1898 than the average for previous years.		
JULY.					AUGUST.				
Av. temp.....	21	+1.25°	—1.14°		Av. temp.....	21	+1.36°	+3.84°	
Range of temp.*....	21	+4°	+6°		Range of temp.*....	21	—3°	+2°	
Av. daily range of temp.*.....	19	+1.63°	+2.76°		Av. daily range of temp.*.....	19	—1.00°	—1.13°	
Cloudiness.....	21	—11 per ct.	—11 per ct.		Cloudiness.....	21	+5 per ct.	+7 per ct.	
Rainfall.....	21	—1.64 in.	—2.24 in.		Rainfall.....	21	+ .19 in.	+ .77 in.	
Atmospheric pres- sure.....	21	+ .017 in.	+ .127 in.		Atmospheric pres- sure.....	21	— .063 in.	+ .022 in.	
SEPTEMBER.					OCTOBER.				
Av. temp.....	21	+2.67°	— .01°		Av. temp.....	21	— .85°	—3.33°	
Range of temp.*....	21	=	—4°		Range of temp.*....	21	+8°	+7°	
Av. daily range of temp.*.....	19	— .02°	—3.14°		Av. daily range of temp.*.....	19	—2.78°	—5.22°	
Cloudiness.....	21	—5 per ct.	+9 per ct.		Cloudiness.....	21	+15 per ct.	+25 per ct.	
Rainfall.....	21	—23 in.	+1.72 in.		Rainfall.....	21	+1.40 in.	+2.02 in.	
Atmospheric pres- sure.....	21	— .076 in.	— .117 in.		Atmospheric pres- sure.....	21	— .064 in.	— .039 in.	
NOVEMBER.					DECEMBER.				
Av. temp.....	21	— .70°	— .59°		Av. temp.....	21	—3.29°	—1.04°	
Range of temp.*....	21	—4°	—6°		Range of temp.*....	21	=	—5°	
Av. daily range of temp.*.....	19	+ .01°	— .06°		Av. daily range of temp.*.....	19	— .96°	— .90°	
Cloudiness.....	21	—1 per ct.	—2 per ct.		Cloudiness.....	21	+3 per ct.	—5 per ct.	
Rainfall.....	21	— .58 in.	— .76 in.		Rainfall.....	21	— .59 in.	— .31 in.	
Atmospheric pres- sure.....	21	— .075 in.	— .001 in.		Atmospheric pres- sure.....	21	— .118 in.	— .016 in.	

*By registering thermometers.

in 1898 was lower than the average for corresponding months in the preceding 21 years.

Whoever will carefully study Diagram I, in this article, and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records, which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the

temperature at a station in the Central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1898.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1898, are taken from the monthly reports by observers. The names of stations are appended; the names of observers are stated in Exhibit 1.

JANUARY.

Depth of snow on ground, Jan. 15, 10.2 inches; Jan. 31, 19.2 inches.—*Marquette*.

Melting snow on ground during entire month.—*Port Huron*.

Snow all melted by rain, Jan. 12, and again Jan. 20. Sleighing Jan. 24 to 31; roads badly drifted. January was quite a pleasant month till toward the close, then rough and cold and stormy. Ice on the ponds about 12 inches thick, depth in the ground not ascertained.—*Thornville*.

Frosts, Jan. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19. Melting snow on ground Jan. 5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 22, 23; no record kept for the rest of the month. Sleighing Jan. 24, 25, 26, 27, 28, 29, 30, 31. Depth of snow on ground, Jan. 15, about one-half inch; Jan. 31, 12 inches.—*Lansing*.

Bees out, Jan. 12.—*Parkville*.

FEBRUARY.

Depth of snow on ground, Feb. 15, 12 inches; Feb. 28, 24.7 inches.—*Marquette*.

Grand Traverse Bay frozen over, Feb. 27.—*Traverse City*.

Snow on ground from Feb. 1 to Feb. 28.—*Port Huron*.

Did not freeze at night, Feb. 9, 10, 11. February was a fair winter month with little very cold weather. The ground, except for a very few days, was well covered with snow for the protection of the wheat. As it closes the frost in the ground is not deep. Ice on ponds is about a foot thick. Snow is deep and roads are badly drifted.—*Thornville*.

Depth of snow on ground, Feb. 15, 3 inches; Feb. 28, 6 inches.

Frosts, Feb. 13, 19, 28. Good sleighing, Feb. 1, 2, 3, 4, 5, 6, 7, 20, 21, 22, 23, 24, 25, 26, 27, 28. Melting snow on ground, Feb. 17, 18, 27, 28. Ice moving in Grand River, Feb. 13, and main channel nearly clear, Feb. 18, but anchor ice along shore.—*Lansing*.

Bees out, Feb. 10, 26. The month will be noted for one of the mildest on record.—*Parkville*.

MARCH.

Depth of snow on ground, Mar. 15, 8 inches. No snow on ground Mar. 31.—*Marquette*.

Ice goes out of Grand Traverse Bay, Mar. 10. Robins arrive, Mar. 20.—*Traverse City*.

Melting snow on ground, Mar. 1, 2, 3, 4, 5, 6, 7, 8, 9. Navigation opened on St. Clair River, Mar. 20, and on Lake Huron, Mar. 23.—*Port Huron*.

Snow melting, Mar. 6. Sleighing gone, Mar. 10. Did not freeze at night, Mar. 9, 10, 11, 26. Frogs first heard, Mar. 24. March was a nice warm month for the season with much pleasant weather. There was sleighing till the 10th. As the month closes there is no frost in the ground and a little plowing has been done. When the snow melted it left the wheat looking finely, never better.—*Thornville*.

Melting snow, Mar. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14. Snow all gone Mar. 15.—*Alma*.

Frosts, Mar. 1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 17, 18, 20, 23, 24, 25, 26, 28, 29, 30, 31. Snow all gone, Mar. 6. Grand River open, Mar. 10. Butterfly seen, Mar. 8. Crows seen, Mar. 5. Song sparrow heard, Mar. 8. Robins and yellow bird seen, Mar. 9. Bluebirds and blackbirds seen, Mar. 14; killdeer, Mar. 19; bullfinch, Mar. 20. Soft maple budded, Mar. 14. There was but little frost in the ground during the first week of March. The ground froze slightly on the surface on the nights of Mar. 5, 6, 7, 8, 9, 15, 16, 17, 18, 20, 24, and hard, Mar. 13, 23, 28, 29, 30, 31. No snow on ground, Mar. 15 and 31.—*Lansing*.

Bees out from Mar. 6, nearly every day till end of month. Robins arrive Mar. 7. Wild geese seen, Mar. 9. Frogs heard, Mar. 19. Ice formed Mar. 20, 23, 25, 28, 29, 31. The precipitation for March was 5.39 inches, which was 2.64 inches above the normal for 19 years.—*Parkville*.

APRIL.

No snow on ground, April 15 and 30. General navigation opened, April 16.—*Marquette*.
 Snow storm, April 1. Snow squalls, April 6. Did not freeze at night, April 13, 14, 16, 22, 23. Dandelions and June-berry in blossom, April 30. Mandrakes coming up. The month is backward, the nights having been cold. The forepart of the month was dry, but since the rains came wheat has made famous progress and never looked better than now. Spring sowed grain cannot grow much, the nights being too cold. The prospects for fruit are excellent.—*Thornville*.

Frosts, ground froze, April 1, 2, 3, 4, 5, 6, 7, 8. Light frosts, April 11, 12, 21, 30. Ice formed, April 27. Swallows and orioles first seen, April 30. Dandelions in bloom, April 17. Capitol lawn mowed April 21, first time of season. Apricot in blossom, April 21; early cherry, April 27; shad-bush, flowering and domestic currant in blossom, April 28. Crab-apple in full leaf, April 28. Soft maple leafing, April 28. No snow on ground, April 15 and 30.—*Lansing*.

Light frost, April 11, 12, 16, 21, 27. Ice formed, April 1, 2, 3, 4, 5, 6, 7, 8.—*Parkville*.

MAY.

Light frosts, May 7, 18, 26, 30, 31. Heavy frosts, May 4, 14. Killing frosts, May 5, 6.—*Sault Ste. Marie*.

Light frosts, May 7, 11, 17. Killing frost, May 6.—*Port Huron*.

Heavy frost, May 6. Barn swallows returned, May 1; yellow-birds, May 3; orioles, May 4; cat-birds, May 7; bobolinks and cuckoos, May 23. Sweet cherries and peach trees in blossom, May 3; sour cherries in blossom, May 11; apples, May 14.—*Thornville*.

Light frosts, May 12, 13, 17. Killing frost, ice formed, May 6. Lilac in full leaf, May 2. Pear, peach and cherry in blossom, May 5; harvest-apple and crab-apple in blossom, May 8; mountain ash in full leaf, May 8; some late apples in blossom, May 12; lilac, May 14; quince, May 20. Most all trees were in full leaf, May 20.—*Lansing*.

Light frost, May 6, 13. The precipitation for May was 3.20 inches, which was 1.14 inches below the normal for 19 years.—*Parkville*.

JUNE.

Light frost, June 15.—*Sault Ste. Marie*.

Wheat heading out, June 2. Fire-flies first seen, June 4. Haying began, June 23. June was a very favorable month for both labor, growth, and vegetation. Every sort of crop is promising. Hay is not quite as good, but fairly good and the acreage is larger than usual. As the month closes wheat is almost ready to cut. If nothing happens to it, the yield will be large.—*Thornville*.

The precipitation for June was 3.14 inches, which was .81 of an inch below the normal for 19 years.—*Parkville*.

JULY.

Heavy frost, July 11.—*Sault Ste. Marie*.

Light frost, July 11.—*Alpena*.

Wheat harvest began, July 5. Katydids first heard, oat harvest begun, July 23. There was a drought in July. The occasional showers had no appreciable effect. As the month closes conditions are getting worse. Corn is not earing; early planted beans and potatoes are a failure, pasturing is gone and the dust is intolerable.—*Thornville*.

Heavy frost, July 10; slight damage to corn and gardens.—*Alma*.

Tornado at Ontonagon.

Condensed report of a tornado occurring at Ontonagon, Mich., July 27, 1898, a full description of which was given in the Ontonagon Herald of July 30, 1898:

It came from the west shortly after 6 P. M. Over the lake for several minutes before the force of the storm reached the town the sky presented a wild and picturesque appearance. Soon it grew dark and the cyclone came with great fury. Trees were uprooted, fences blown down, gardens leveled, and rain came down in torrents, followed by large hailstones. Every few seconds the wild scene was illuminated by flashes of lightning, followed by peals of thunder. The storm lasted fully fifteen minutes. A barn was struck, Firemen's hall, a structure 50 by 99 feet, two stories high, collapsed, and came down with a crash. The damage to crops on outlying farms was considerable, produce of all kinds being mowed down as if cut with a machine, and many orchards were ruined. There was no loss of life.

Remarks by Henry B. Baker, M. D., Secretary of the State Board of Health:

I believe this same tornado went over Lansing about the same time in the evening. It was a grand sight, but did not do much damage. A letter from Mrs. Baker, describes the same thing at Macatawa Park, about ninety miles exactly west of Lansing, on Lake Michigan shore.

Locust first heard, July 29.—*Lansing*.

The precipitation for the month was 1.73 inches, which was 2.77 inches below the average for July for 19 years. The greatest amount for July during that period was 10.93 inches in July, 1889, and the least was .43 of an inch in July, 1890. Normal, 4.50 inches.—*Parkville*.

Reports of damage by the frost of July 11, to corn and other crops in the State, were made to the Detroit Evening News of July 11, 1898, from localities as follows: East Jordan, Charlotte, Gaylord, Evart, Traverse City, Onondaga and Bear Lake.

AUGUST.

August was a month of drought with little very hot weather. There was a considerable rainfall, but coming in small showers, mostly, it always dried out, with sun and wind, and did no permanent good. One thing about the season is very noticeable and not easy to account for, and that is the early ripening of everything, crops, fruits and weeds—corn cut in August, etc. Past seasons of drought have shown no such instances of early ripening. The migratory birds, too, are leaving us earlier than usual.—*Thornville*.

The month will be noted for the lowest average temperature on record. The precipitation for August was 4.59 inches, which was 1.23 inches above the normal for 19 years. Crab-apple trees blossomed, Aug. 13.—*Parkville*.

SEPTEMBER.

Heavy frosts, Sept. 10, 20.—*Sault Ste. Marie*.

Killing frosts, Sept. 10, 11.—*Alpena*.

First frost, light, during the night, Sept. 11.—*Port Huron*.

September was very dry, with some very hot weather. No killing frost yet as the month closes. On stubble land wheat has come up poorly, on fallows it looks very well.—*Thornville*.

Light frost, Sept. 11.—*Detroit*.

Light frosts, Sept. 11, 12, 25, 26, 27, 28.—*Parkville*.

Light frost, first of season, Sept. 20.—*Lansing*.

OCTOBER.

Light frost, Oct. 23. Snow-fall for October, 3.7 inches. No snow on ground Oct. 15 and 30.—*Marquette*.

Heavy frosts, Oct. 1, 6, 7. Killing frost, Oct. 8.—*Sault Ste. Marie*.

First snow, all melted as it fell, Oct. 26. A warm month for the season, a continuation of the long drought till Oct. 10, when it was definitely broken by an inch and 21-100 of rain. This with the precipitation since was timely for the winter wheat, which never promised better than now. Water in the streams and ponds is low, the large rainfall (4 inches and over) having been all absorbed by the thirsty soil which is not yet thoroughly wet down. As the month closes, the corn (which is a very poor crop) is not much of it husked, and there are some potatoes (poor too) to dig.—*Thornville*.

Frosts, Oct. 15, 28.—*Ann Arbor*.

Heavy frost, Oct. 15. Killing frost, Oct. 27.—*Detroit*.

Dandelions in bloom, Oct. 23, 29. First killing frost of season, Oct. 15; ice formed and ground frozen in places. Other killing frosts, Oct. 26, 27, 28, 29. Ground froze, Oct. 27, 28. First snow of season, Oct. 26. No snow on ground, Oct. 31.—*Lansing*.

Wild geese flying, Oct. 14. Light frosts, Oct. 9, 15, 16. Killing frosts, Oct. 27, 28, 29.—*Parkville*.

NOVEMBER.

Depth of snow on ground, Nov. 15, trace; Nov. 31, 0.5 of an inch.—*Marquette*.

White frost, Nov. 15, 16.—*Traverse City*.

Did not freeze at night, Nov. 1, 4, 7, 24. The month was warm at first, but wintry at last. The heavy storms were unfavorable for farm work and considerable corn is caught out unhusked.—*Thornville*.

Heavy frost, Nov. 27.—*Ann Arbor*.

Bees out, Nov. 2, 3, 4, 19.—*Parkville*.

Dandelions in bloom on capitol lawn, Nov. 1, 2, 3, 4, 5. Light frosts, Nov. 3, 20. Hard frosts, Nov. 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23, 25, 26, 27, 28, 29, 30. First heavy snow of season, night of Nov. 9. Ground froze Nov. 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 23, 24, 25, 26, 27, 28, 29, and still in the ground Nov. 30. First sleighing, Nov. 10, gone Nov. 13. Depth of snow on ground, Nov. 15, about 4 inches; on Nov. 30, about 1.50 inches. Grand River closed, Nov. 27, first time of season. Open, Nov. 30. Indian summer days, Nov. 3, 4, 5, 21. Trees covered with heavy white frost, Nov. 27, 28.—*Lansing*.

DECEMBER.

Depth of snow on ground, Dec. 15, 6 inches; Dec. 31, 6.50 inches. Navigation closed, Dec. 15.—*Marquette*.

Snow made indifferent sleighing, Dec. 4 to 16. Ice storm, Dec. 15. A mild, open winter month. Ice on the ponds about six inches thick. Wheat fields inclining to the north are quite well protected with a little snow. Southern exposures need protection. No frost in the ground in the woods.—*Thornville*.

Frosts, Dec. 18, 19.—*Ann Arbor*.

Hard frosts, Dec. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 19, 30, 31. Frost in ground Dec. 1 to 31. Sleighing, Dec. 1, 7, 8, 9, 10. Cold waves, Dec. 27, 30, 31. Grand River closed, Dec. 8, second time of season. Depth of snow on ground, Dec. 15, about one inch; on Dec. 31, none.—*Lansing*.

CHANGE OF EXPOSURE OF INSTRUMENTS AT LANSING IN 1884.

Comments on the subject of a new instrument shelter at Lansing are printed on page 21. Report for 1885. Exhibits A, B, C, and D. pages 22 and 23, of the Report of 1886, relate to that subject, and may be studied in connection with what is said on page 21, Report for 1885. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years.

EXHIBIT 7.—Depth of wells; depth of ground above water in well; temperature of water in well, and day of observation of such temperature, in each month of the year 1898, as reported by meteorological observers for the State Board of Health, and for the United States Weather Bureau. (The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.)

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.
Traverse City Asylum.....	55	40 4	47 ²⁶	55	40	47 ²⁶	55	40 4	47 ²⁹	55	40 2	47 ²²	55	40 6	48 ¹⁶	55	40 6	48 ¹⁶
Lansing S. B. of H.....	26 11½	25 10½	51 ¹⁷	26 11½	25 5½	50 ¹⁴	26 11½	25 1½	50 ¹⁶	26 11½	24 9	50 ¹⁶	26 11½	24 8½	50 ¹⁶	26 11½	24 11½	51 ²²
Ann Arbor.....	17	11 6	45 ¹⁵	17	9 5¼	41 ¹⁴	17	6 5¾	39 ¹⁶	17	10 ¼	43 ¹⁶	17	10 10	45 ¹⁶	17	11 7	45 ¹⁵
Stations in Michigan.	July.			August.			September.			October.			November.			December.		
	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.	Depth of well.—Ft., in.	Depth of ground above water in well.—Ft., in.	Temp. of water in well.—Deg. F.
Traverse City Asylum.....	55	39	48 ²¹	55	39	48 ²¹	55	38 9	48 ²¹	55	39	48 ²⁵	55	39 2	48 ²⁸	55	39 9	47 ²⁶
Lansing S. B. of H.....	26 11½	25	52 ¹⁶	26 11½	25 5½	51 ¹⁶	26 11½	25 8½	53 ¹⁵	26 11½	26 ¼	53 ¹⁷	26 11½	25 11	53 ¹⁵	26 11½	26 2	52 ¹⁶
Ann Arbor.....	17	11 8	55 ¹⁵	17	12	53 ¹⁷	17	11 6	56 ¹⁶	17	10 6	55 ²³	17	9 4½	52 ²⁰	15 2	9 2	44 ²⁸

Temperature of the Atmosphere.

The average temperature by months, for the 19 years, 1879-97, at Lansing, and a comparison of 1898, by months, with that average, are stated in Exhibit 10.

The average temperatures at each of 11 stations in Michigan, and the average for 9 stations in 1898, and in each month of that year, are stated in Table I.

EXHIBIT 8.—*Average temperature by year and months in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97.* These averages are for groups of several stations in Michigan.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97	46.34	21.46	23.41	29.84	44.84	56.21	66.39	70.89	68.07	61.54	49.27	36.17	28.00
Av. 19 years, 1879-97	46.06	21.28	22.61	29.44	44.35	56.19	66.39	70.62	67.79	61.30	49.04	35.98	27.81
1897 (10 stations)---	46.57	22.40	25.64	31.86	43.93	53.55	63.07	73.28	65.59	64.22	53.45	36.06	25.75
1898 (9 stations)----	47.62	25.65	24.47	36.78	43.77	56.91	67.75	72.14	69.43	64.21	50.12	35.47	24.71
In 1898 higher than av. for 21 years, 1877-97-----	1.28	4.19	1.06	6.94	-----	.70	1.36	1.25	1.36	2.67	.85	-----	-----
In 1898 lower than av. for 21 years, 1877-97-----	-----	-----	-----	-----	1.07	-----	-----	-----	-----	-----	-----	.70	3.29
In 1898 higher than in 1897-----	1.05	3.25	-----	4.92	-----	3.36	4.68	-----	3.84	-----	-----	-----	-----
In 1898 lower than in 1897-----	-----	-----	1.17	-----	.16	-----	-----	1.14	-----	.01	3.33	.59	1.04

*At from 9 to 22 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 17, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 8, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

The average annual and monthly temperatures at from 9 to 22 stations for a period of 21 years, 1877-97, are stated in Exhibit 8, in which is also given, by months, a comparison of 1898 with the average for 1897, and with the averages for the 21 years, 1877-97. By Exhibit 8, which gives averages for groups of several stations in Michigan, it appears that in 1898 the mean temperature in February, April, July, September, October, November, and December was lower than in those months in 1897. It also appears that January, February, March, May, June, July, August, September and October were warmer than the average temperature for the corresponding months for the 21 years, 1877-97.

TABLE I.—Average temperature in degrees Fahr., for the year, and for each month of the year 1898, at each of 9 stations in Michigan, and also average line for the 9 stations. From observations made daily at 7 A. M., 2 P. M. and 9 P. M.,* local time, by observers† for the State Board of Health.

Stations in Michigan.†	Divi- sions of the State. ††	Temperature in degrees Fahr.													
		Year.		Months, †† 1898.											
				Norm. **	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.
		Av. for 9 stations§	-----	-----	47.62	25.65	24.47	36.78	43.77	56.91	67.75	72.14	69.43	64.21	50.12	35.47	24.71
Rockland.....	U. P.	41.55 ²	41.85	19.01	17.90	30.20	41.56	51.92	60.51	67.47	62.83	59.86	43.51	31.39	16.03
Traverse City.....	N. W.	44.45 ¹⁶	46.69	25.60	24.87	36.12	40.82	53.28	64.60	70.25	66.73	64.46	49.96	37.57	25.87
Harrisville.....	N. E.	43.02 ¹⁰	44.82	23.00	21.79	32.82	39.82	51.13	61.93	68.56	66.98	62.94	49.71	36.02	23.16
Thornville.....	B. & E.	47.96 ²²	49.03	26.95	24.63	38.45	44.87	58.77	70.10	72.98	71.16	65.78	51.95	36.56	26.19
Agr'l College.....	C.	46.19 ³⁵	48.17	26.21	24.44	37.56	44.37	58.37	69.19	73.01	70.45	63.58	50.43	34.40	25.99
Alma.....	C.	-----	50.11	27.58	29.48	38.77	47.05	61.51	71.69	74.95	71.61	64.96	51.66	36.00	26.01
Lansing, S. B. of H.‡	C.	47.41 ²⁰	48.94	27.73	25.33	38.87	44.90	58.49	69.76	73.48	70.90	64.52	50.85	35.78	26.67
Ann Arbor.....	S. C.	47.12 ¹⁸	49.13	27.40	26.00	39.40	45.10	58.70	69.80	73.70	71.90	65.30	51.10	35.60	25.60
Battle Creek.....	S. C.	-----	¶	29.80	-----	39.74	47.14	-----	-----	-----	-----	-----	49.25	36.51	26.35
Tecumseh.....	S. C.	-----	§§	27.33	26.11	38.83	45.74	59.14	68.93	73.69	71.22	-----	50.60	35.48	25.46
Birmingham.....	S. E.	48.01 ¹²	49.83	27.38	25.82	38.80	45.47	60.05	72.11	74.90	72.34	66.46	51.89	35.90	26.88

*The daily averages are one-third the sum of these three observations.

†The names of observers, their place of observation, and the counties in which these places are situated, are stated in Exhibit 1.

§ This line is an average for only the 9 stations from which statements nearly complete were received for every month of the year. It does not include Battle Creek and Tecumseh.

**Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

††The computations for average temperature, as tabulated for months in 1898, were made at the following stations: Ann Arbor and the Agricultural College. All other computations in Table I were made at the office of the State Board of Health.

‡Beginning with the year 1855, allowance must be made for Lansing in Table I, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

§§The names of divisions, and the counties in each, are stated in Exhibit I, in preceding reports.

¶The average for 6 months is 38.13.

§§For 11 months, 47.50.

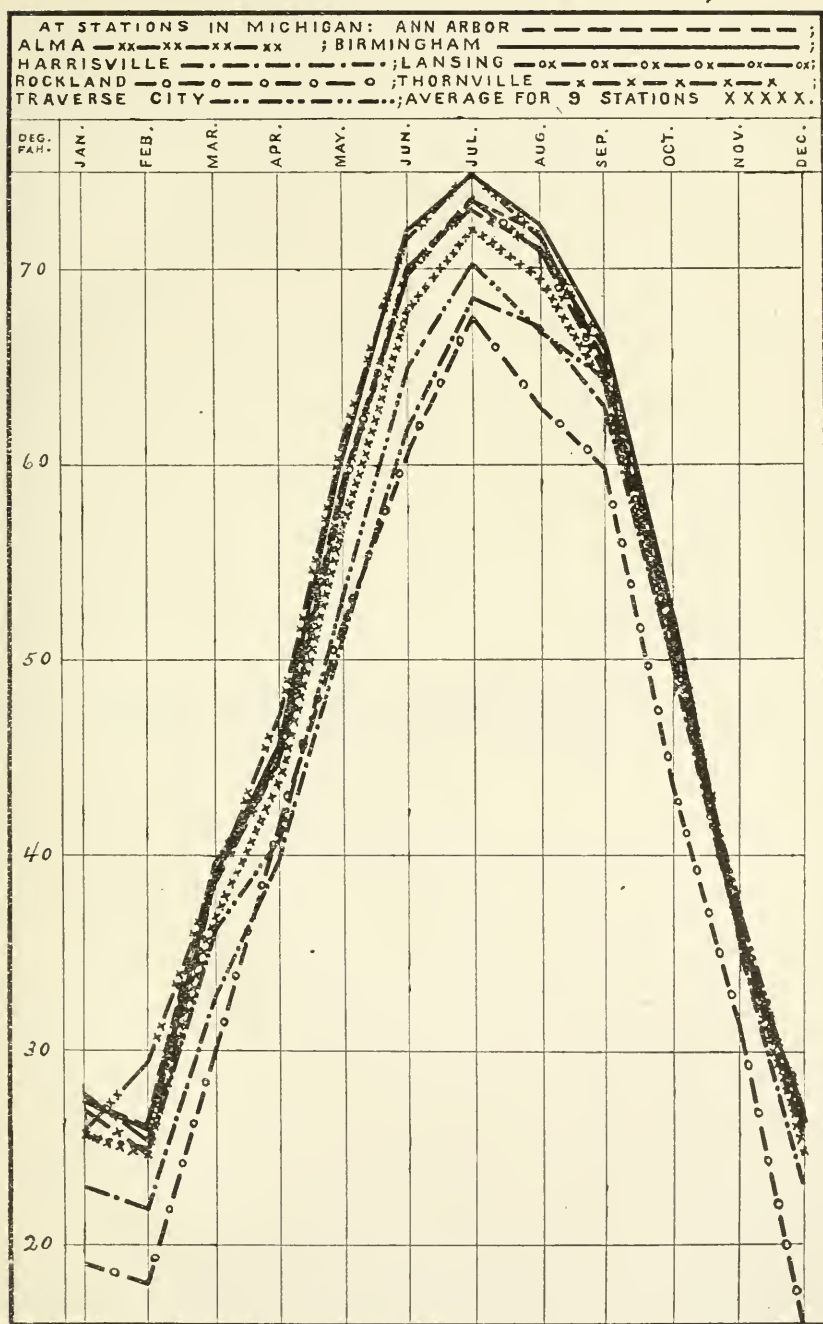
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 20 days. b For 29 days. c For 28 days. d For 26 days. e For 25 days. f For 23 days.

The average line and lines for nine representative stations in Table I are graphically represented in Diagram I.

The average daily range of temperature at from 6 to 19 stations per year, by months, for a period of 19 years, 1879-97, and a comparison of 1898 with the monthly averages for that period and for 1897, are given in Exhibit 12. The highest and lowest temperatures in every month in 1898, at each of 14 stations, are stated in Table II. The average daily range of temperature by months in 1898, at each of 16 stations, and the average for 12 of the stations, are stated in Table III. The lines for 10 of

DIAGRAM 1- AVERAGE TEMPERATURE BY MONTHS, 1898.



these stations, and the average line for 12 of the stations, are represented in Diagram II. It will be noticed that the greatest average daily range occurred during the month of July.

EXHIBIT 9.—*Comparison of the average temperature during the year and during each month of the year 1898, with the annual and with the monthly averages for the year 1897, and with the averages for the 34 years, 1864-97. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 34 years, 1864-97	46.57	21.87	23.69	30.91	46.01	57.93	67.77	71.40	68.59	60.59	48.18	35.52	26.56
1897.....	47.01	22.34	26.38	33.00	44.58	55.79	64.21	73.79	65.94	62.92	53.06	36.49	25.62
1898.....	48.17	26.21	24.49	37.56	44.37	58.37	69.19	73.01	70.45	63.58	50.43	34.40	25.99
In 1898 higher than av. for 34 years, 1864-97.....	1.60	4.34	.80	6.65	-----	.44	1.42	1.61	1.86	2.99	2.25	-----	-----
In 1898 lower than av. for 34 years, 1864-97.....	-----	-----	-----	-----	1.64	-----	-----	-----	-----	-----	-----	1.12	.57
In 1898 higher than in 1897.....	1.16	3.87	-----	4.56	-----	2.58	4.98	-----	4.51	.66	-----	-----	.37
In 1898 lower than in 1897.....	-----	-----	1.89	-----	.21	-----	-----	.78	-----	-----	2.63	2.09	-----

EXHIBIT 10.—*Average temperature by year and months in 1898* compared with annual and monthly averages for 1897, and for the 19 years, 1879-1897. Observations made at office State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 years, 1879-97	47.32	22.27	24.05	31.29	46.49	58.12	68.12	72.06	68.58	61.88	49.80	36.72	28.52
1897.....	47.82	23.74	26.85	33.52	45.06	55.30	65.53	74.32	66.19	64.53	54.31	37.52	26.98
1898.....	48.94	27.73	25.33	38.87	44.90	58.49	69.76	73.48	70.90	64.52	50.85	35.78	26.67
In 1898 higher than av. for 19 years. 1879-97.....	1.62	5.46	1.28	7.58	-----	.37	1.64	1.42	2.32	2.64	1.05	-----	-----
In 1898 lower than av. for 19 years. 1879-97.....	-----	-----	-----	-----	1.59	-----	-----	-----	-----	-----	-----	.94	1.85
In 1898 higher than in 1897.....	1.12	3.99	-----	5.85	-----	3.19	4.23	-----	4.71	-----	-----	-----	-----
In 1898 lower than in 1897.....	-----	-----	1.52	-----	.16	-----	-----	.84	-----	.01	3.46	1.74	.31

*Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 10, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

EXHIBIT 11.—Average temperature in degrees Fahr., for the year and months, 1898, at office State Board of Health, State Capitol, Lansing, Michigan, computed from readings at 7 A. M., 3 P. M. and 9 P. M., daily, from registers of the Draper self-recording thermometer, compared with observations made with Green's standard mercurial thermometer at the same hours; both thermometers placed in double latticed shelter for instruments, in the southwest part of the Capitol yard.

Tri-daily readings of instruments specified.	Year.	Average temperature, in degrees Fahr.—Year and months, 1898.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. temp. from tri-daily observations with Green's standard mercurial thermometer.....	48.94	27.73	25.33	38.87	44.90	58.49	69.76	73.48	70.90	64.52	50.85	35.78	26.67
Av. temp. computed from readings of the Draper self-recording thermometer.....	46.68	26.19	24.62	37.55	42.93	56.34	66.49	69.89	67.53	61.79	48.59	34.21	24.04
Higher by Draper's than by Green's thermometer.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lower by Draper's than by Green's thermometer.....	2.26	1.54	.71	1.32	1.97	2.15	3.27	3.59	3.37	2.73	2.26	1.57	2.63

EXHIBIT 12.—Average daily range of temperature, by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 19 years, 1879-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Average daily range of temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 years, 1879-97	18.02	15.42	16.91	17.35	19.15	20.33	20.72	21.02	20.47	20.18	17.38	14.13	13.21
1897 (16 stations)...	17.82	14.11	12.78	16.73	18.74	19.72	20.77	19.89	20.60	23.30	19.82	14.20	13.15
1898 (12 stations)...	17.20	13.87	14.31	16.93	17.58	19.01	21.40	22.65	19.47	20.16	14.60	14.14	12.25
In 1898 greater than av. for 19 years, 1879-97.....	-----	-----	-----	-----	-----	-----	.68	1.63	-----	-----	-----	.01	-----
In 1898 less than av. for 19 years, 1879-97.....	.82	.55	2.60	.42	1.57	1.32	-----	-----	1.00	.02	2.78	-----	.96
In 1898 greater than in 1897.....	-----	-----	1.53	.20	-----	-----	.63	2.76	-----	-----	-----	-----	-----
In 1898 less than in 1897.....	.62	.24	-----	-----	1.16	.71	-----	-----	1.13	3.14	5.22	.06	.90

*At from 6 to 19 stations per year for the 19 years, 1879-97. Just which stations in each year, up to 1897, are shown on page 21, report for 1898.

TABLE II.—*Extremes of temperature and days of month on which the highest and for the year, 1898, at each of 14 stations in Michigan.—As indicated by daily readings P. M., by observers* for the State Board of Health, and for the United States Weather*

Line number.	Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Year 1898.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 14 Stations†.....	100	-18	118	58	-10	57	-18	70	-3	78	8	83	29
2	Rockland‡.....	93	-15	108	45 ⁹	-5 ³¹	54 ⁸	-15 ³	60 ⁸	4 ⁴	74 ¹⁵	11 ^{4,5}	83 ⁸	29 ⁴
3	Marquette§.....	94	-8	102	39 ⁹	2 ²⁹	42 ¹¹	-8 ³	56 ⁹	12 ³	66 ¹²	17 ⁴	78 ²⁶	36 ^{3,4}
4	Sault Ste. Marie.....	89	-18	107	36 ⁹	30-31 ¹²	46 ⁸	-18 ³	52 ¹⁶	-3 ³	63 ^{12,27}	8 ⁴	75 ⁹	29 ⁶
5	Traverse City‡.....	96	-2	98	42 ¹⁹	0 ³¹	49 ⁸	-2 ²	60 ²⁶	7 ²	72 ¹⁶	14 ²	83 ³¹	31 ⁶
6	Alpena§.....	94	-8	102	38 ⁵	-7 ³⁰	45 ¹¹	-8 ³	58 ¹⁶	9 ⁵	64 ¹¹	14 ⁵	81 ¹⁹	33 ⁶
7	Harrisville‡.....	97	-15	112	40 ⁷	29-31 ⁸	42 ¹¹	-15 ²	55 ¹⁶	6 ²	60 ²¹	11 ²	80 ¹⁹	33 ^{4,5}
8	Grand Haven§.....	90	-1	91	50 ¹²	8 ³¹	57 ¹¹	-1 ¹	62 ²⁷	12 ⁵	68 ¹⁴	15 ⁵	81 ²¹	32 ⁶
9	Port Huron§.....	98	-6	104	52 ¹²	3 ³⁰	55 ¹¹	-6 ^{2,3}	68 ¹⁹	11 ⁵	67 ¹²	15 ³	77 ²⁷	35 ⁶
10	Thorndike‡.....	97	-10	107	48 ¹²	-10 ³⁰	52 ¹¹	-6 ^{1,3}	66 ¹⁹	4 ³	69 ^{13,30}	15 ⁵	78 ²⁷	36 ⁷
11	Alma‡.....	98	-9	107	41 ¹²	-9 ³¹	47 ¹⁰	-4 ¹	68 ²⁵	7 ³	78 ^{11,12}	16 ⁵	82 ²⁷	33 ⁶
12	Lansing, S. B. of H.‡.....	96	-6	102	55 ¹²	-4 ³¹	52 ¹¹	-6 ^{1,2}	69 ¹⁶	2-3,4,5 ⁹	71 ¹⁶	16 ⁴	79 ²¹	32 ⁵
13	Ann Arbor¶.....	100	-6	106	58 ¹²	3 ¹	55 ¹¹	-6 ³	70 ¹⁶	10 ³	78 ¹⁶	15 ⁵	79 ²¹	33 ⁶
14	Tecumseh‡.....	-----	-----	-----	58 ¹²	-3 ³¹	55 ¹¹	-6 ^{2,3}	69 ¹⁹	10 ²	72 ¹⁶	17 ⁴	78 ^{20,21}	34 ⁵
15	Birmingham‡.....	99	-10	109	52 ¹²	-5 ³¹	53 ¹¹	-10 ¹	68 ¹⁹	10 ⁵	69 ¹²	17 ⁴	81 ^{20,21}	32 ⁵
16	Detroit§.....	97	-4	101	57 ¹²	2 ³¹	56 ¹¹	-4 ¹	69 ¹⁹	16 ⁵	66 ¹²	18 ⁵	77 ²⁰	37 ⁶

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or lowest temperature occurred.

* The names of observers, etc., are stated in Exhibit 1.

† The line No. 1, and the three columns for the year 1898, relate only to the 14 stations from which observations were received for every month of the year. It does not include Tecumseh.

‡ For stations marked thus ‡, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Weather Bureau, the maximum thermometer was read and recorded at 8:00 A. M., and the minimum at 8:00 P. M., 75th Meridian time. The local time at these stations corresponding to 8:00 A. M. and 8:00 P. M., 75th Meridian time, is as follows: At Port Huron, 7:30 A. M. and 7:30 P. M.; at Detroit, 7:28 A. M. and 7:28 P. M.; at Alpena, 7:26 A. M. and 7:26 P. M.; at Grand Haven, 7:15 A. M. and 7:15 P. M.; at Marquette, 7:11 A. M. and 7:11 P. M.; at Sault Ste. Marie, 7:23 A. M. and 7:23 P. M.

¶ At Ann Arbor, the maximum thermometer was read at 7 A. M., and the minimum thermometer at 9 P. M.

‡ Beginning with the year 1885 allowance must be made for Lansing in Table II, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B, on page 22, report for 1886.

Note from opposite page.

*For the years 1874-76, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882-98, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

the lowest temperature occurred by months of the year 1898; also, extremes and range of registering thermometers, or by observations made daily at 7 A. M., 2 P. M. and 9 Bureau.

June.		July.		August.		September.		October.		November.		December.		Line number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
96	39	99	37	100	42	98	32	89	16	67	3	51	-17	1
87 ³	2 ²⁵ 42	90 ¹⁷	43 ⁴	84 ²⁰	45 ²⁷	93 ²	35 ¹⁰	77 ¹	17 ²⁸	60 ³	27 ²⁸ 3	42 ¹⁷	-15 ³¹	2
90 ²⁴	40 ¹²	93 ¹⁷	45 ⁵	82 ²⁰	45 ¹³	94 ²	38 ¹⁰	76 ¹	29 ²⁶	66 ⁴	11 ²⁴	40 ¹⁷	-6 ³¹	3
88 ²⁴	39 ¹⁵	89 ²	40 ¹¹	85 ³¹	2 ¹³ 46	88 ^{1,3}	37 ¹⁰	68 ¹	16 ²⁷	67 ⁴	24 ²⁵ 10	17 ¹⁸ 37	-17 ³¹	4
96 ²⁴	40 ¹⁴	96 ¹⁷	37 ¹⁰	92 ³¹	45 ²⁶	94 ²	38 ¹⁹	80 ^{1,2}	28 ²⁷	67 ⁴	22 ²³ 12	45 ²⁹	0 ³¹	5
93 ²⁴	43 ¹⁵	93 ²	42 ¹¹	94 ³¹	45 ²⁷	91 ³	37 ¹⁰	75 ³	22 ²⁷	66 ⁴	18 ²⁴	45 ²⁹	2 ²⁸	6
95 ²⁴	15 ¹⁶ 41	14 ²⁰ 33	40 ¹⁰	97 ³¹	47 ²⁶	95 ²	35 ¹⁰	78 ³	26 ²⁷ 32	63 ⁴	12 ²⁴	43 ²⁹	-6 ³¹	7
85 ⁷	41 ²¹	90 ²⁴	45 ¹¹	80 ³⁰	50 ¹⁸	85 ^{1,3}	38 ¹¹	79 ³	32 ²⁶	65 ⁴	6 ²⁷	44 ²⁹	8 ²⁶	8
92 ³⁰	45 ²²	95 ¹⁷	47 ¹⁰	98 ²³	48 ²⁷	95 ^{1,2}	39 ¹¹	85 ³	28 ²⁷	65 ⁴	24 ²⁵ 15	48 ²⁹	3 ¹⁴	9
24 ²⁰ 91	46 ²¹	94 ³	42 ¹¹	97 ²³	27 ²⁸ 45	97 ³	36 ¹¹	87 ³	27 ³¹ 29	65 ⁴	14 ²⁴	18 ²⁰ 40	1 ¹³	10
91 ^{6,7}	45 ²¹	98 ²⁴	43 ¹¹	23 ³¹ 90	49 ²⁵	92 ¹	11 ¹² 36	83 ³	27 ²⁷	65 ⁴	12 ²⁷	44 ²⁸	-5 ²⁵	11
93 ²⁴	43 ²⁰	96 ²⁴	42 ⁹	23 ³¹ 94	26 ²⁷ 48	94 ³	35 ¹⁰	86 ³	28 ²⁶	66 ⁴	24 ²⁵ 14	29 ¹³ 49	5 ²⁵ 5	12
93 ²⁴	44 ²¹	98 ²⁴	45 ¹⁰	100 ²³	46 ²⁷	98 ²	36 ¹¹	89 ³	26 ²⁷	67 ⁴	9 ²⁶	51 ²⁹	13 ¹⁵ 5	13
89 ²⁴	46 ²¹	2 ¹⁵ 92	10 ¹¹ 46	93 ²³	46 ²⁷	-----	-----	82 ³	28 ²⁸	66 ⁴	9 ²⁷	48 ²⁹	-1 ¹³	14
95 ²⁴	45 ²	23 ²⁴ 99	9 ¹⁰ 48	96 ²³	18 ²⁶	97 ²	32 ¹⁰	84 ³	28 ²⁸	64 ⁴	10 ²⁷	47 ²⁹	2 ¹⁴	15
93 ³⁰	49 ¹⁵	94 ²	49 ¹¹	97 ³¹	51 ²⁷	1 ² 95	47 ¹¹	85 ³	30 ²⁷	64 ⁴	14 ²³	49 ²⁹	4 ¹⁴	16

EXHIBIT 13.—Comparisons of the average daily range of temperature for the year, and for each month of the year 1898, with averages for the 24 years, 1874-97, and for the year 1898. Observations made with registering thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.

Years, etc.	Average daily range of temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 24 years, 1874-97*	29.61	12.80	18.68	19.08	22.29	23.62	23.76	25.71	26.37	25.21	21.61	16.56	15.39
1897.....	22.74	15.97	15.29	19.42	21.33	26.18	27.70	28.61	29.06	30.60	26.39	16.84	15.51
1898.....	20.74	18.30	16.70	19.50	22.90	23.20	25.30	29.30	24.00	24.60	17.50	15.50	12.10
In 1898 greater than av. for 24 years, 1874-97.....		5.50		.42	.61		1.54	3.59					
In 1898 less than av. for 24 years, 1874-97.....	8.87		1.98			.42			2.37	.61	4.11	1.06	3.29
In 1898 greater than in 1897.....		2.33	1.41	.08	1.57			.69					
In 1898 less than in 1897.....	2.00					2.98	2.40		5.06	6.00	8.89	1.34	3.41

TABLE III.—Average daily range of temperature, by registering thermometers during the year and during each month of the year, 1898, at each of 16 stations in Michigan, and average for 12 stations.

Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Divi- sions of the State.†	Nor- mal. + -	Average daily range of temperature—Degrees Fahr.												
			Year 1898.	Months, 1898.											
				Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 stations§	-----	-----	17.20	13.87	14.31	16.93	17.58	19.01	21.40	22.65	19.47	20.16	14.60	14.14	12.25
Rockland.....	U. P.	-----	¶	18.45	19.80 ^e	21.84	26.74	24.20 ^a	-----	21.16	17.16	22.13	15.71 ^c	20.20	17.47 ^a
<i>Marquette</i>	U. P.	15.04 ¹³	14.15	12.50	11.60	14.29	11.80	14.80	19.30	19.70	14.00	17.60	10.80	11.90	11.50
<i>Sault Ste. Marie</i>	U. P.	16.92 ⁷	17.23	18.60	15.90	18.20	19.30	19.70	19.70	21.60 ^b	16.90	17.30	12.80	12.10	14.60
Traverse City....	N. W.	19.72 ¹⁷	19.45	14.65	16.32	19.03	20.07	21.90	22.70	25.90 ^b	21.23	22.56	17.39	16.50	15.19
<i>Alpena</i>	N. E.	15.51 ¹⁹	14.62	12.71	12.70	12.97	15.47	15.03	18.10	18.77	16.84	17.77	12.13	11.50	11.39
Harrisville.....	N. E.	19.85 ¹⁴	18.96	18.00	17.89	18.61	16.66	17.61	22.10	23.09	19.97	22.40	16.23	18.40	16.52
<i>Grand Haven</i>	W.	15.17 ⁹	15.68	11.70	13.30	15.60	17.60	19.60	18.60	19.10	17.50	16.50	13.90	13.80	10.90
<i>Port Huron</i>	B. & E.	15.81 ¹⁹	15.76	12.20	12.30	16.70	15.30	16.60	20.50	19.80	17.70	20.20	13.30	13.20	11.30
Thornville.....	B. & E.	21.80 ¹⁹	16.89	10.97	12.86	15.74	18.20	20.07	21.73	23.94	21.68	20.90	14.23	13.37	9.00
Agr'l College.....	C.	21.09 ¹⁷	20.74	18.30	16.70	19.50	22.90	23.20	25.30	29.30	24.00	24.60	17.50	15.50	12.10
Alma.....	C.	-----	††	14.05	-----	21.74	25.70	24.77	24.63	22.77	21.81	23.57	15.16	-----	14.84
Lansing, S. B. of H.	C.	19.43 ²⁰	19.21	14.29	15.00	19.58	19.97	21.23	23.77	25.94	22.68	23.37	17.10	14.80	12.84 ^d
Ann Arbor.....	S. C.	18.29 ¹⁷	20.23	13.20	15.60	20.10	21.60	21.80	26.10	29.00	25.70	24.80	17.80	16.67	10.41
Tecumseh.....	S. C.	-----	††	14.97	15.50	20.42	19.73	19.68	21.66	23.13	19.16	-----	16.38	16.70	13.13
Birmingham.....	S. E.	20.83 ¹²	19.30	16.16	17.00	16.39	18.74	23.03	25.16	25.71	23.13	21.87	16.16	15.33	12.90
<i>Detroit</i>	S. E.	15.51 ²⁰	14.90	11.40	11.20	15.90	16.30	16.80	19.00	19.30	16.30	16.70	13.40	12.10	10.40

*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I.

†The counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the annual average range of temperature for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include Rockland, Alma and Tecumseh. The data for the Agricultural College was received too late to be used in average for stations.

¶The average for 11 months is 20.44. ††For 10 months 20.90. ‡‡For 11 months 18.22.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 26 days. e For 25 days.

Graphic representations of statements in Table III are given in Diagram II.

DIAGRAM II:- AV. DAILY RANGE OF TEMPERATURE, BY MONTHS, 1898.

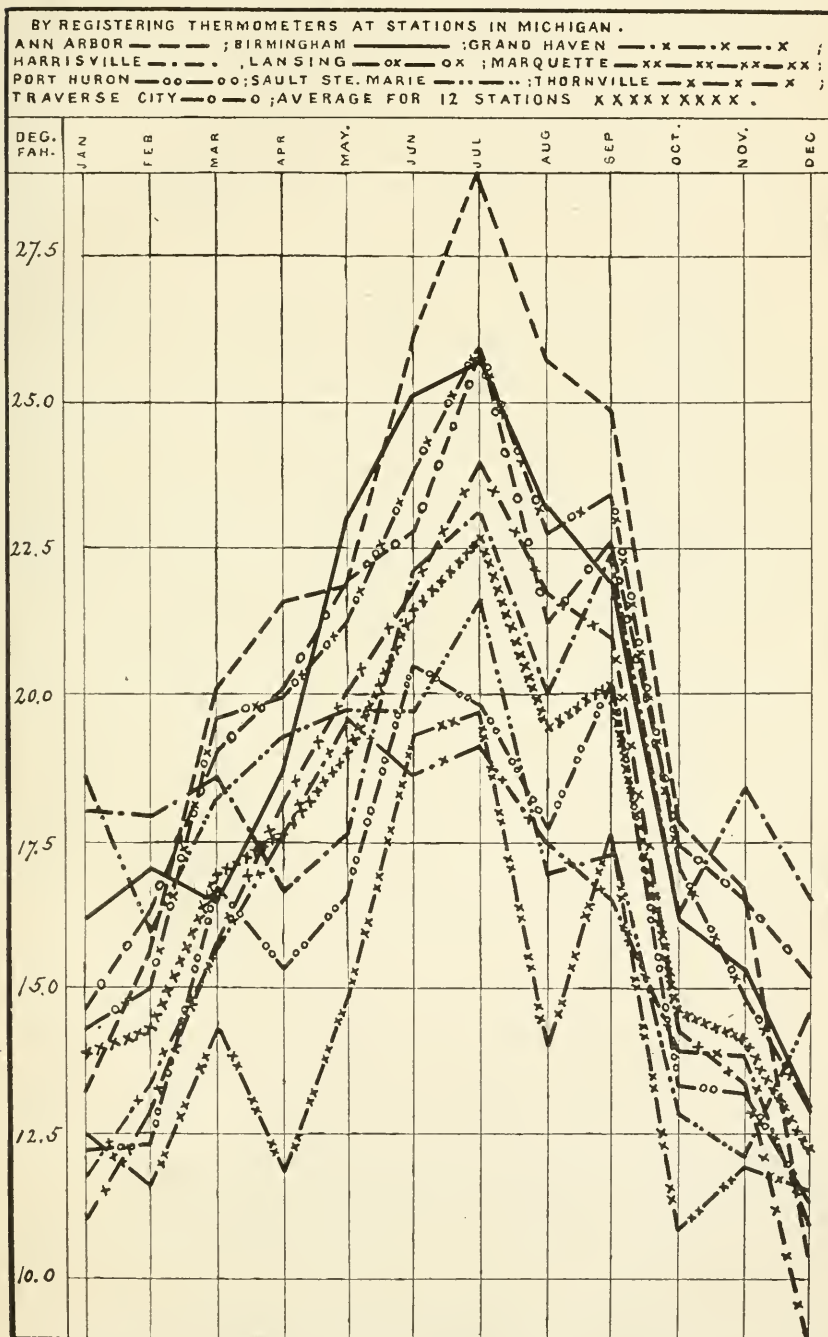


EXHIBIT 14.—*Comparisons of the extremes and the range of temperature (degrees Fahr.) during the year, and during each month of the year 1898, with the average of the extremes, and of the range, for the 21 years, 1877-97, also statement of the extremes and of the range for each of the seven years, 1892-98. Observations made with registering thermometers by observers for the State Board of Health, and for the U. S. Weather Bureau. These comparisons, etc., are for groups of several stations in Michigan.*

Year and months.	Extremes and ranges of temperature—Degrees Fahrenheit.																								1898 higher (+), or lower (—), than av. 21 years, 1877-97.		
	1892.			1893.			1894.			1895.			1896.			1897.			Av. for 21 years, 1877-97.			1898.*					
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.			
Year.	102	-24	126	97	-26	123	102	-26	128	100	-28	128	98	-25	123	102	-21	123	100	-25	125	100	-18	118	=	+7	-7
Av. month	77	12	65	77	11	66	81	10	71	80	9	71	78	9	69	78	10	68	79	11	68	79	13	66	=	+2	-2
January..	57	-22	79	49	-26	75	57	-18	75	50	-12	62	45	-25	70	58	-19	77	54	-20	74	58	-10	68	+4	+10	-6
February.	52	-24	76	44	-23	67	54	-26	80	54	-28	82	59	-22	81	46	-21	67	55	-21	76	57	-18	75	+2	+3	-1
March....	64	-13	77	66	-6	72	79	-2	81	69	-16	85	69	-16	85	70	-14	84	66	-13	79	70	-3	73	+4	+10	-6
April.....	79	13	66	80	9	71	88	12	76	82	17	65	87	7	80	79	5	74	83	9	74	78	8	70	-5	-1	-4
May	85	27	58	88	27	61	94	30	64	98	26	72	98	33	65	84	22	62	90	24	66	83	29	54	-7	+5	-12
June.....	102	34	68	96	36	60	98	33	65	99	37	62	91	37	54	92	27	65	95	33	62	96	39	57	+1	+6	-5
July	97	41	56	96	43	53	102	37	65	100	38	62	95	39	56	102	46	56	98	40	58	99	37	62	+1	+3	+4
August...	95	37	58	97	38	59	99	32	67	97	36	61	96	35	61	94	38	56	97	36	61	100	42	58	+3	+6	-3
Septem'ber	92	30	62	89	22	67	99	29	70	98	28	70	88	22	66	98	28	70	94	28	66	98	32	66	+4	+4	=
October..	82	23	59	84	22	62	80	20	60	80	10	70	77	15	62	91	25	66	84	19	65	89	16	73	+5	+3	+8
Novemb'r	64	5	59	68	6	62	67	-7	74	72	-1	73	67	-3	70	65	-5	70	69	1	68	67	3	64	-2	+2	-4
December	58	-11	69	62	-14	76	60	-19	79	63	-24	87	59	-16	75	57	-16	73	58	-10	68	51	-17	68	-7	-7	=

*For the 22 years, 1877-98, the highest temperature was 105°, at Battle Creek, September 9, 1884; the lowest was 36° at Manistique, January 27, 1885.

EXHIBIT 15.—Average absolute humidity, by year and months in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Absolute humidity—Grains of vapor in a cubic foot of air.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97.	3.46	1.45	1.53	1.82	2.84	3.99	5.53	6.08	5.75	4.93	3.49	2.32	1.81
1897 (8 stations) ----	3.57	1.57	1.58	2.00	2.93	3.91	5.26	6.85	5.61	5.18	3.89	2.38	1.71
1898 (7 stations) ----	3.57	1.46	1.53	2.33	2.67	4.24	5.78	6.05	6.04	5.31	3.75	2.22	1.47
In 1898 greater than av. for 21 years, 1877-97. ....	.11	.01	0	.51	-----	.25	.25	-----	.29	.38	.26	-----	-----
In 1898 less than av. for 21 years, 1877-97 -----	-----	-----	-----	-----	.17	-----	-----	.03	-----	-----	.10	.34	-----
In 1898 greater than in 1897 -----	0	-----	-----	.33	-----	.33	.52	-----	.43	.13	-----	-----	-----
In 1898 less than in 1897 -----	-----	.11	.05	-----	.26	-----	-----	.80	-----	-----	.14	.16	.24

*At from 6 to 23 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 27, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 15, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, on page 23, report for 1886.

EXHIBIT 16.—Average relative humidity, by years and months, in 1898, compared with annual and monthly averages for 1897, and for the 20 years, 1878-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Per cent of saturation—Relative humidity.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 20 years, 1878-97.	76	83	82	79	71	70	73	71	73	76	76	80	83
1897 (8 stations)....	78	83	82	81	77	76	76	76	77	77	77	80	83
1898 (8 stations)....	77	81	81	78	72	74	74	68	75	75	80	80	82
In 1898 greater than av. for 20 years, 1878-97.....	1	-----	-----	-----	1	4	1	-----	2	-----	4	0	-----
In 1898 less than av. for 20 years, 1878-97.....	-----	2	1	1	-----	-----	-----	3	-----	1	-----	-----	1
In 1898 greater than in 1897.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3	0	-----
In 1898 less than in 1897.....	1	2	1	3	5	2	2	8	2	2	-----	-----	1

*At from 7 to 22 stations per year for the 20 years, 1878-97. Just which stations in each year, up to 1897, are shown on page 28, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 16, because of a change in the location of the instruments. The amount of the variation is shown in Exhibit D, on page 23, report for 1886.

TABLE IV.—ABSOLUTE HUMIDITY.—*The average number of grains of vapor of water in a cubic foot of air for months and year, 1898, at 9 stations in Michigan; also average line for 7 stations.—Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.*

Stations in Michigan.*	Divisions of the State. †	Grains of vapor in a cubic foot of air.—(Absolute humidity.)§													
		Year.		Months, 1898.											
		Norm. ‡	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 stations*	-----	-----	3.57	1.46	1.53	2.33	2.67	4.24	5.78	6.05	6.04	5.31	3.75	2.22	1.47
Rockland.....	U. P.	-----	**	-----	-----	2.08	2.35 d	3.47	4.74	5.55 e	5.15	4.29	3.03	2.23	-----
Traverse City.....	N. W.	3.39 ¹⁷	3.55	1.84	1.84	2.37	2.68	3.85	5.41	5.78	5.84	5.41	3.60	2.35	1.65
Harrisville.....	N. E.	3.05 ⁴	3.28	0.94	0.92	1.82	2.40	3.72	5.10	5.77	6.08	5.65	3.67	2.09	1.19
Thornville.....	B. & E.	3.66 ²²	3.66	1.80	1.76	2.51	2.83	4.28	5.80	6.07	5.95	5.10	3.68	2.40	1.78
Alma.....	C.	-----	3.77	1.61	1.60	2.45	3.04	4.93	6.33	6.18	6.22	5.31	3.93	2.18	1.41
Lansing, S. B. of } H. }	C.	3.38 ²⁰	3.45	1.54	1.52	2.32	2.48	4.12	5.63	5.71	5.84	5.07	3.64	2.14	1.44
Ann Arbor.....	S. C.	3.51 ¹⁸	3.52	1.01	1.52	2.33	2.48	4.31	5.91	6.37	6.06	5.10	3.65	2.11	1.42
Tecumseh.....	S. C.	-----	††	1.69 a	1.63	2.44	2.84	4.46	5.75 d	6.45 b	6.54	-----	3.87 a	2.26 d	1.47 a
Birmingham.....	S. E.	3.64 ¹²	3.76	1.51	1.55	2.54	2.80	4.48	6.25	6.45	6.31	5.51	4.09	2.26	1.41

*The names of the observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

†The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual absolute humidity for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the absolute humidity denote the number of years included in the average.

§The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII., of the Smithsonian Meteorological and Physical Tables (1859).

¶This line is an average for only the stations at which observations were made tri-daily, and from which statements, nearly complete, were received for every month of the year. It does not include the lines for Rockland and Tecumseh.

**The average for 9 months is 3.65. ††For 11 months, 3.58.

||Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, page 23, report for 1886.

NOTE.—The computations of absolute humidity at Ann Arbor for each month in 1898 were furnished by the observer there. All other computations in Table IV were made at the office of the Secretary of the State Board of Health.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations.

b For 91 observations.

c For 90 observations.

d For 88 observations.

e For 86 observations.

f For 67 observations.

The "average" line and the lines for six stations in Table IV. are graphically represented in Diagram III.

DIAGRAM III- ABSOLUTE HUMIDITY, BY MONTHS, 1898.

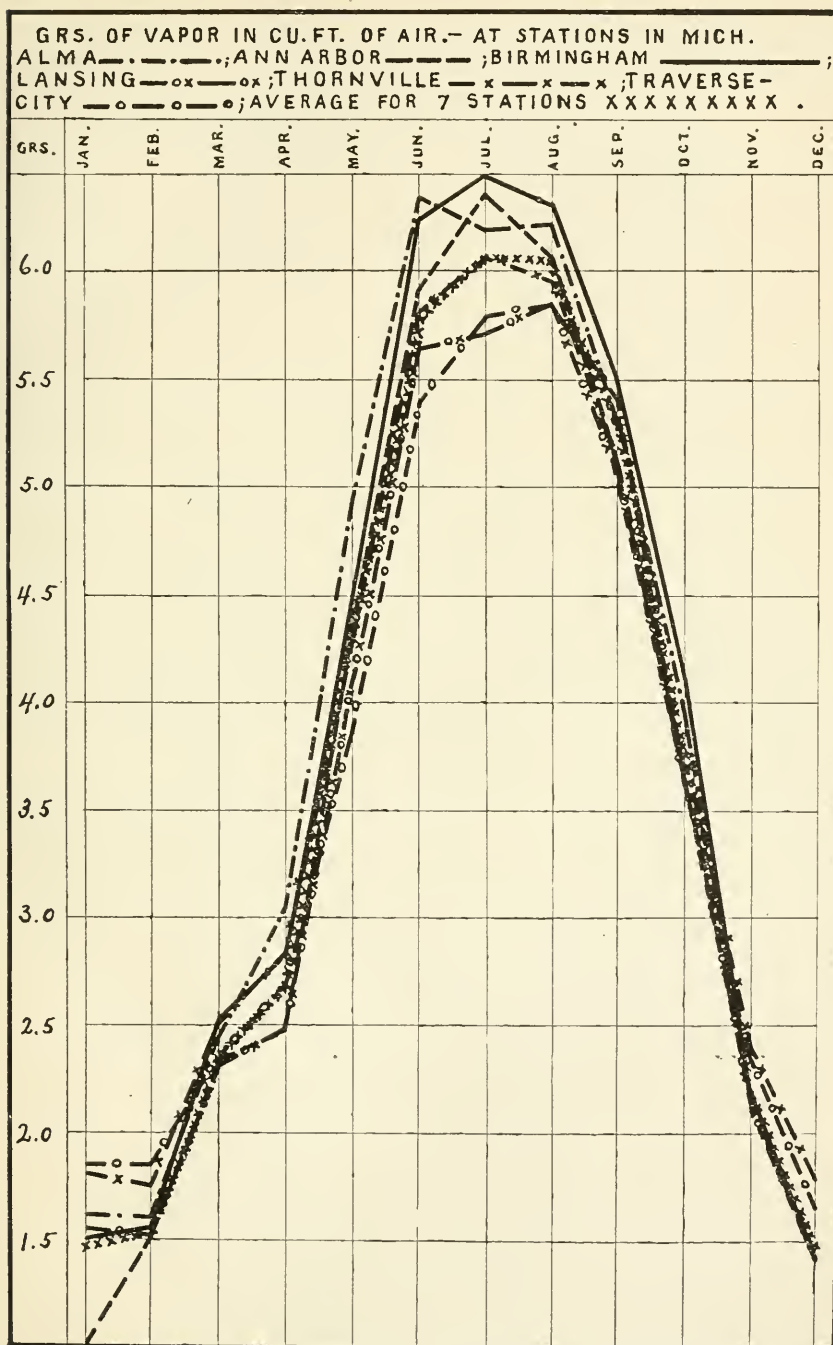


TABLE V.—RELATIVE HUMIDITY.—Average per cent of saturation of the atmosphere with vapor of water for months and year 1898 at 8 stations in Michigan; also average line for 8 stations. Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.

Stations in Michigan.*	Divisions of the State. †	Per cent of saturation.—Relative humidity.													
		Year.		Months, 1898.											
		Norm. ‡	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations.§	-----	-----	77	81	81	78	72	74	74	68	75	75	80	80	82
Rockland.....	U. P.	-----	¶	-----	-----	89	66 d	68	74	a e	a 77	d 68	d 82	f 81	-----
Traverse City....	N. W.	82 ¹⁷	81	95	95	84	78	77	76	68	78	75	79	77	86
Harrisville.....	N. E.	68 ⁴	72	57	54	71	73	78	79	71	81	82	80	72	70
Thornville.....	B. & E.	78 ²¹	77	88	89	80	72	69	68	67	69	68	74	83	91
Agr'l college.....	C.	80 ³⁵	90	95	97	89	83	86	86	82	87	86	91	94	100
Alma.....	C.	-----	74	79	78	76	69	73	71	62	72	73	80	77	75
Lansing, S. B. of { H. ¶¶	C.	72 ²⁰	70	76	76	71	61	66	67	60	69	71	75	76	75
Ann Arbor.....	S. C.	79 ¹⁸	76	83	85	76	67	74	70	66	70	72	81	83	83
Tecumseh.....	S. C.	-----	**	83 a	79	76	70	71	70 d	69 b	77	-----	81	81	79 a
Birmingham.....	S. E.	76 ¹²	74	74	75	79	69	70	72	67	72	76	83	79	72

NOTE.—The observations in Table V were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor in 1898 were made by the observer there. All other computations in Table V were made at the office of the State Board of Health.

*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 4.

†The full names of the divisions, and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual relative humidity for periods of years ending in each case with December 31, 1898. The small figures above and at the right of the numbers which state the relative humidity, denote the number of years included in the average.

§This line is an average for only the stations at which observations were made tri-daily and from which statements, nearly complete, were received for every month in the year. It does not include Rockland and Tecumseh.

¶The average for 9 months is 75. **For 11 months, 76.

¶¶Beginning with the year 1885, allowance must be made for Lansing in Table V, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D, on page 23, report for 1886.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations.

b For 91 observations.

c For 90 observations.

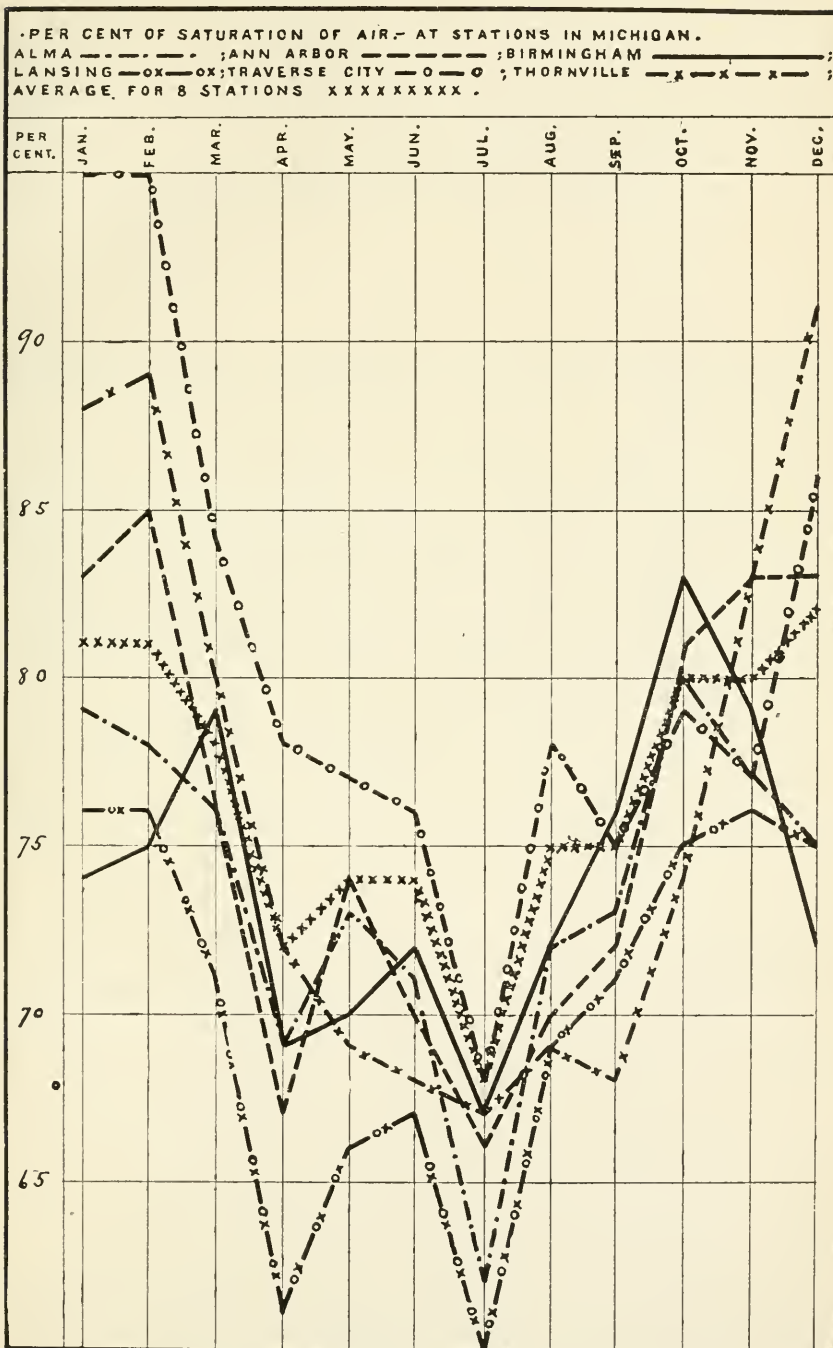
d For 88 observations.

e For 86 observations.

f For 67 observations.

Graphic representations of six representative lines in Table V are given in Diagram IV.

DIAGRAM IV.- RELATIVE HUMIDITY, BY MONTHS, 1898.



FOGS.

For the year 1898, fog was reported at 80 morning observations, at 21 afternoon observations (at about 2 P. M.), at 24 evening observations (at about 9 P. M.), and 26 times during the day, no special time being mentioned, in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 85 days.

EXHIBIT 17.—*Number of different days on which fog was observed at one or more of 12 stations in Michigan* in 1898, and each month of the year 1898.*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
85	7	8	13	4	5	8	6	7	12	1	9	5

*This exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Rockland, Marquette, Harrisville, Traverse City, Grand Haven, Port Huron, Thornville, Lansing, Ann Arbor, Parkville, Birmingham and Alma.

Exhibit 17, "Number of different days on which fog was observed," etc., supplies knowledge of the *time*, in each month, on which fog was observed, somewhere in Michigan. Exhibit 18, "Number of observations at which fog was observed," etc., supplies knowledge of the *time* combined with the *area* of the occurrences of fog. For the State as a whole, therefore, the last-mentioned exhibit supplies the most important information. Therefore, in this report the diagram relative to fog is made to exhibit the facts contained in this last-mentioned exhibit. Heretofore it has represented the "Number of different days on which fog was observed at one or more stations in Michigan."

EXHIBIT 18.—*Number of observations at which fog was observed in Michigan in 1898, and in each month of the year 1898. (Observations taken 3 times daily,* at 12 stations.)†*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
125	16	32	16	5	10	8	0	5	10	1	13	9

*At the U. S. Weather Bureau Stations the observations were made at 8 A. M. and 8 P. M., 75th Meridian time, unless otherwise stated.

†This exhibit contains statements only for those localities from which registers were received for every month of the year; the localities are stated in a foot-note to Exhibit 17 above.

Graphic representations of statements in Exhibit 18 are given in Diagram V.

DIAGRAM V.- CONCERNING FOGS IN MICHIGAN IN 1898 .

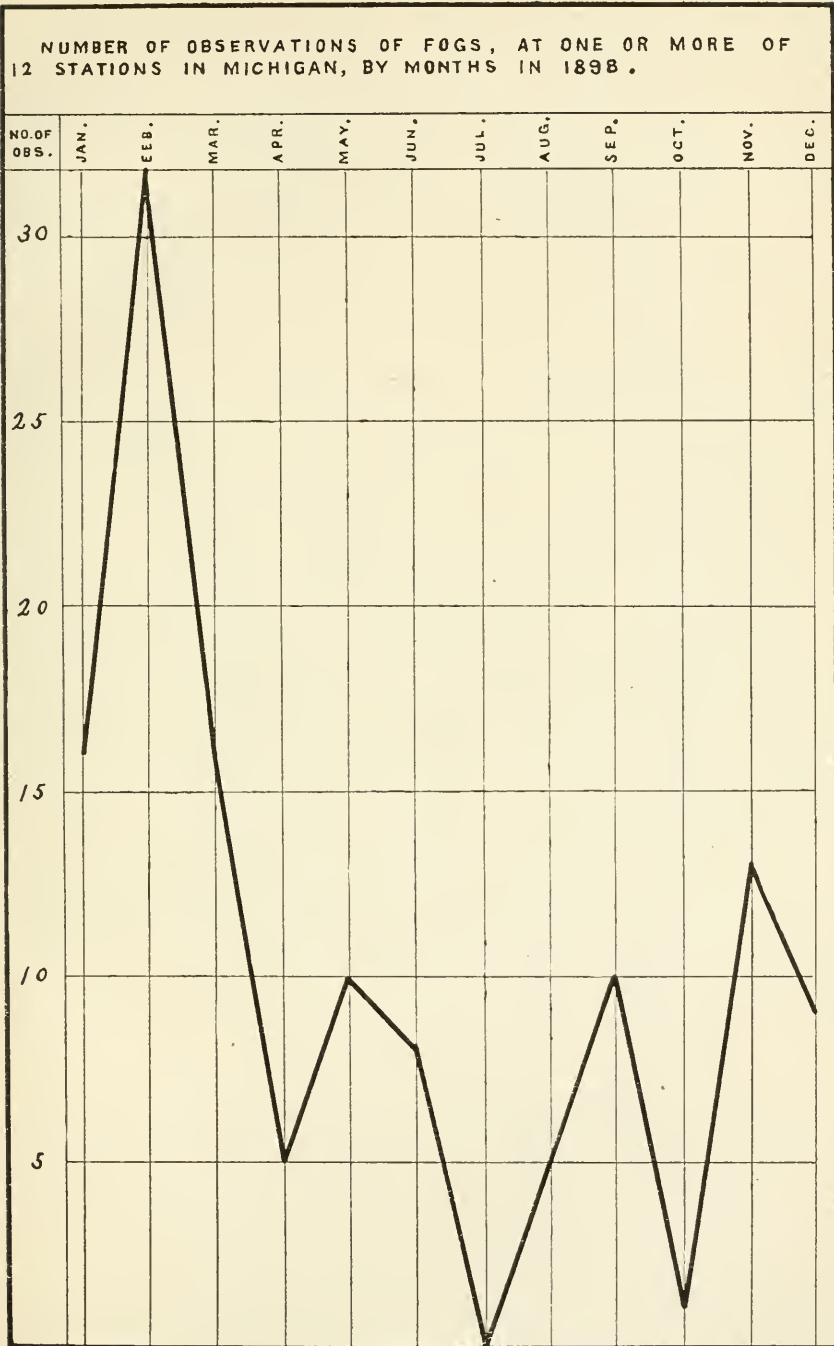


TABLE VI.—Average per cent of cloudiness for months and year 1898, at 10 stations in Michigan; also average line for 9 stations. Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.

Stations in Michigan.*	Divi- sions of the State.†	Average per cent of cloudiness.													
		Year.		Months, 1898.											
		Norm. + —	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations‡.	-----	-----	57	71	78	57	51	50	42	29	47	39	71	69	77
Rockland.....	U. P.	58 ³	59	a 76	o 74	k 51	d 45	d 52	f 45		f 59	k 38	e 79		c 80
Traverse City....	N. W.	59 ¹⁷	58	i 76	a 88	d 55	a 41	e 45	h 37	e 31	f 48	f 41	f 72	f 74	f 87
Harrisville.....	N. E.	62 ¹⁴	67	b 85	b 90	b 66	b 57	b 55	b 57	b 39	b 56	b 57	b 75	b 78	b 84
Thornville.....	B. & E.	51 ²²	51	c 67	c 66	c 56	c 49	c 46	c 40	c 21	c 36	c 29	c 60	c 63	c 80
Agr'l College.....	C.	57 ³⁵	48	d 62	d 65	d 55	d 46	d 41	d 34	d 15	d 36	d 32	d 65	d 61	d 65
Alma.....	C.	-----	47	e 58	e 67	e 49	e 45	e 44	e 32	e 20	e 35	e 41	e 65	e 57	e 55
Lansing, S.B.of H.	C.	57 ²⁰	61	f 74	f 79	f 65	f 55	f 53	f 46	f 30	f 53	f 39	f 77	f 77	f 80
Ann Arbor.....	S. C.	56 ¹⁹	57	g 73	g 78	g 62	g 57	g 54	g 40	g 27	g 41	g 37	g 71	g 67	g 78
Tecumseh.....	S. C.	-----	5	h 63	h 70	h 52	h 50	h 47	h 35	h 25	h 36	-----	h 71	h 56	h 68
Birmingham.....	S. E.	59 ¹²	61	i 71	i 80	i 58	i 61	i 57	i 50	i 32	i 57	i 35	i 78	i 73	i 80

*The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

†The full names of divisions and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

§This line is an average for all the stations at which tri-daily observations were made, and from which statements, nearly complete, were received for every month of the year. It does not include Tecumseh.

¶The average for 11 months is 52.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.
i For 83 observations. j For 82 observations. k For 80 observations. l For 79 observations.
m For 78 observations. n For 77 observations. o For 73 observations.

Graphic representations of ten representative lines in Table VI are given in Diagram VI.

DIAGRAM VI—AV. PER CENT OF CLOUDINESS, BY MONTHS, 1898.

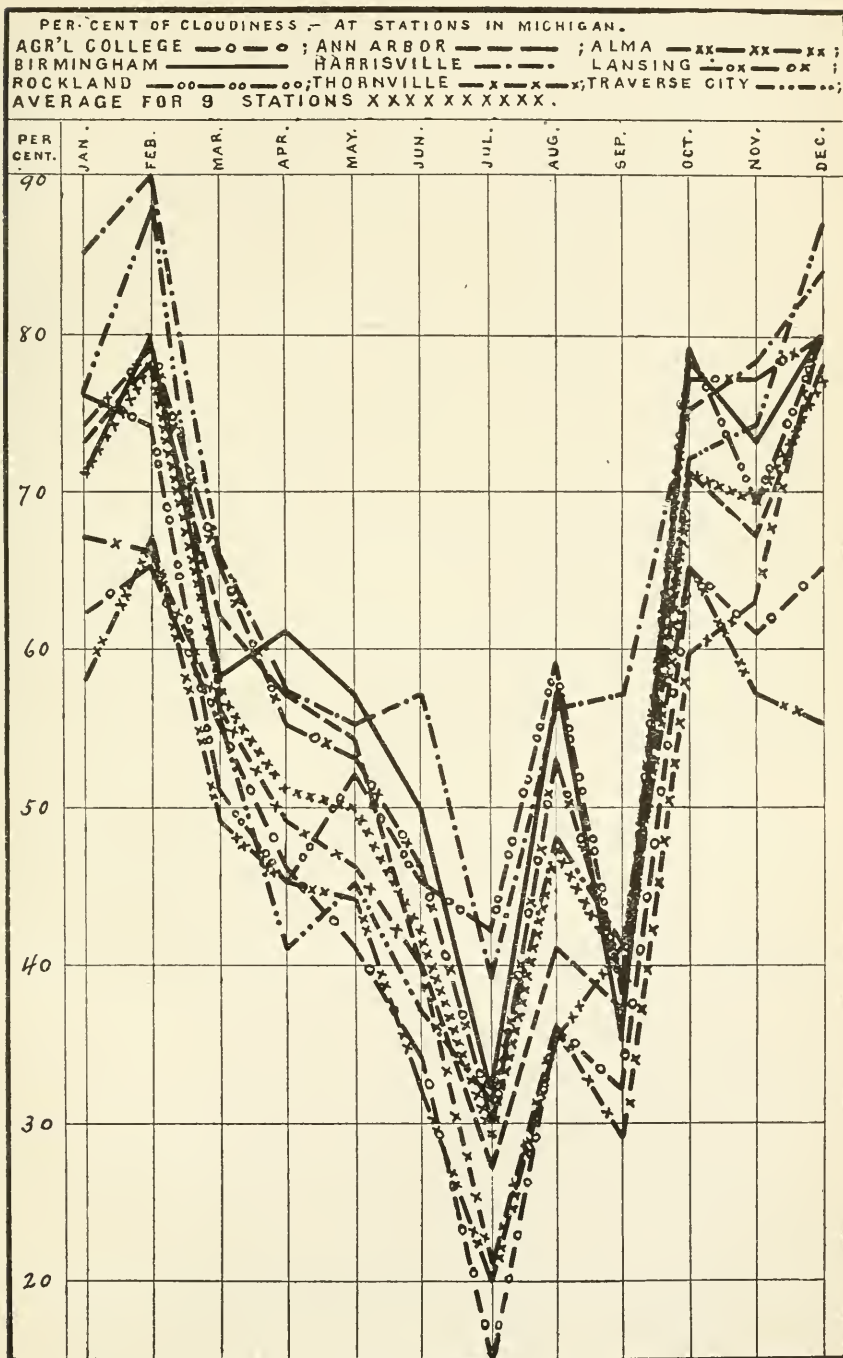


EXHIBIT 19.—Average per cent of cloudiness, by year and months in 1898, compared with annual and monthly averages for 1897, and for 21 years, 1877-97*. These averages are for groups of several stations in Michigan.

Years, etc.	Per cent of cloudiness.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97	56	71	65	57	52	50	47	40	42	44	56	70	74
1897 (10 stations)...	57	78	78	62	60	52	48	40	40	30	46	71	82
1898 (9 stations)....	57	71	78	57	51	50	42	29	47	39	71	69	77
In 1898 greater than av. for 21 years, 1877-97.....	1	0	13	0	-----	0	-----	-----	5	-----	15	-----	3
In 1898 less than av. for 21 years, 1877-97.....	-----	-----	-----	-----	1	-----	5	11	-----	5	-----	1	-----
In 1898 greater than in 1897.....	0	-----	0	-----	-----	-----	-----	-----	7	9	25	-----	-----
In 1898 less than in 1897.....	-----	7	-----	5	9	2	6	11	-----	-----	-----	2	5

*At from 8 to 23 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 48, report for 1898.

EXHIBIT 22.—Inches of rain and melted snow, by year and months in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97*. These averages are for groups of several stations in Michigan.

Years, etc.	Inches of rain and melted snow.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97	34.45	2.33	2.34	2.19	2.56	3.59	3.63	3.03	3.02	3.08	3.01	3.14	2.61
1897 (16 stations)...	32.15	3.64	1.28	3.04	2.72	3.74	2.50	3.63	2.44	1.13	2.39	3.32	2.33
1898 (14 stations)...	33.19	3.09	2.43	3.27	1.65	2.44	3.87	1.39	3.21	2.85	4.41	2.56	2.02
In 1898 greater than av. for 21 years, 1877-97.....	-----	.76	.09	1.08	-----	-----	.24	-----	.19	-----	1.40	-----	-----
In 1898 less than av. for 21 years, 1877-97.....	1.26	-----	-----	-----	.91	1.15	-----	1.64	-----	.23	-----	.58	.59
In 1898 greater than in 1897.....	1.04	-----	1.15	.23	-----	-----	1.37	-----	.77	1.72	2.02	-----	-----
In 1898 less than in 1897.....	-----	.55	-----	-----	1.07	1.30	-----	2.24	-----	-----	-----	.76	.31

*At from 12 to 23 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 50, report for 1898.

EXHIBIT 21.—*Dates of solar and lunar halos*

Line number.	Stations.	Dates of halos recorded,									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Thornville.....		3, 31								
2	Lansing.....	7, 10, 17, 19	3, 7, 11	4, 6, 7, 14, 15	2, 6, 7	1, 8, 15, 25	6, 8	6, 8, 13, 21, 30	27	6, 15, 31	6
3	Parkville.....			16	7		7				
4	Marquette.....						2	1			
5	Ann Arbor.....						25			9	

recorded on the monthly registers in 1898.

months, 1898.

June.		July.		August.		September.		October.		November.		December.		Line number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
16														1
15, 21, 25		18		2, 15				16, 17, 27, 29	23, 24, 27	1, 12, 20, 25	20	10, 26, 31	28	2
								24, 26						3
														4
		30						24, 27, 28						5

Parhelia, Jan. 3; Feb. 1; Dec. 14.—*Thornville.* Jan. 19, 25, 31; Feb. 2; March 6, 15, 25, 30; April 8, 13, 28, 30; May 6, 8, 18; Sept. 3; Oct. 3; Dec. 2, 12, 14, 28; Paraselene, March 6.—*Lansing.* Jan. 8.—*Rockland.* July 2, Lunar rainbow.—*Traverse City.*

EXHIBIT 20.—*Dates of auroras observed and recorded at 6 stations in Michigan during the year 1898.*

Stations.	Dates of auroras recorded in 1898.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Lansing.....			14						2			
Marquette.....		18										
Alma.....		16	14									
Ann Arbor.....			14									
Thornville.....				12								
Sault Ste. Marie.....					29							

TABLE VII.—*Inches of rain and melted snow for months and year 1898, at 16 stations in Michigan; also average line for 14 stations,—as compiled from daily observations made by observers* for the State Board of Health, and for the U. S. Weather Bureau.*

Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Divi- sions. of the State. †	Inches of rain and melted snow.													
		Year.		Months, 1898.											
		Norm. ‡	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 14 stations§		-----	33.19	3.09	2.43	3.27	1.65	2.44	3.87	1.39	3.21	2.85	4.41	2.56	2.02
Rockland.....	U. P.	-----	13 31.35	2.02	2.40	2.05	-----	1.28	-----	-----	1.94	2.00	3.10	2.80	2.80
Marquette.....	U. P.	-----	7 31.35	2.48	1.43	3.08	2.32	1.72	3.16	3.86	2.57	1.16	1.47	3.40	1.79
Sault Ste. Marie...	U. P.	-----	7 33.92	27.91	1.20	1.77	2.98	0.68	3.28	3.07	1.52	4.18	3.42	2.53	2.02
Traverse City....	N. W.	-----	17 37.19	39.86	5.08	2.16	3.39	2.79	2.86	3.42	0.94	6.87	1.85	6.15	1.44
Alpena.....	N. E.	-----	26 34.86	34.07	3.43	2.41	2.51	1.47	2.78	5.76	0.82	4.24	2.91	5.43	1.09
Harrisville.....	N. E.	-----	12 33.90	38.92	3.40	2.15	2.95	2.06	2.17	6.89	0.48	4.20	3.66	6.27	2.00
Grand Haven.....	W.	-----	8 34.90	36.02	3.85	3.12	3.55	1.71	2.21	2.45	0.88	4.04	4.06	5.19	2.81
Port Huron.....	B. & E.	-----	24 31.74	33.14	2.97	2.99	3.64	1.24	1.61	3.40	1.44	2.87	2.34	4.28	3.19
Thornville.....	B. & E.	-----	22 32.29	28.09	2.58	2.02	2.94	1.45	2.49	3.30	1.24	2.27	1.41	4.12	2.91
Agr'l College.....	C.	-----	35 30.99	31.72	2.94	1.74	3.61	2.08	2.15	4.44	1.10	2.73	3.00	3.54	2.72
Lansing, S. B. of I. H.....	C.	-----	19 33.05	31.56	3.04	1.93	3.22	1.81	1.98	4.48	1.36	3.32	2.50	3.45	2.70
Ann Arbor.....	S. C.	-----	11 30.13	31.62	3.69	2.16	2.95	1.57	2.21	2.82	1.45	1.16	4.03	5.48	2.94
Parkville.....	S. C.	-----	18 41.16	38.89	3.55	2.88	5.30	1.41	3.69	3.14	1.73	4.65	2.75	3.79	3.56
Tecumseh.....	S. C.	-----	-----	4.97	1.86	4.59	1.98	2.94	2.95	2.61	1.74	-----	5.99	3.79	2.58
Birmingham.....	S. E.	-----	12 30.31	30.86	2.84	2.33	3.30	1.59	1.88	2.01	1.86	1.39	3.24	4.57	3.70
Detroit.....	S. E.	-----	27 32.68	34.34	3.32	3.27	3.11	1.51	1.65	5.15	2.03	1.84	3.30	3.49	2.92

*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†The names of divisions, and the counties in each, are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the annual average rainfall for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the rainfall denote the number of years included in the average.

§This line is an average for all the stations, from which statements are given for every month of the year. It does not include Rockland and Tecumseh.

¶The total rainfall for 9 months in 1898 is 20.39 inches. ||For 11 months, 36 inches.

NOTE.—The computations of amount of rainfall were furnished by the observers at Detroit, Alpena, Grand Haven, Port Huron, Ann Arbor, Sault Ste. Marie, Marquette, and the Agricultural College for the year. All other computations in Table VII were made in the office of the Secretary of the State Board of Health.

The average line and lines for 8 representative stations in Table VII. are graphically represented in Diagram VII.

DIAGRAM VII.-RAINFALL, BY MONTHS, 1898.

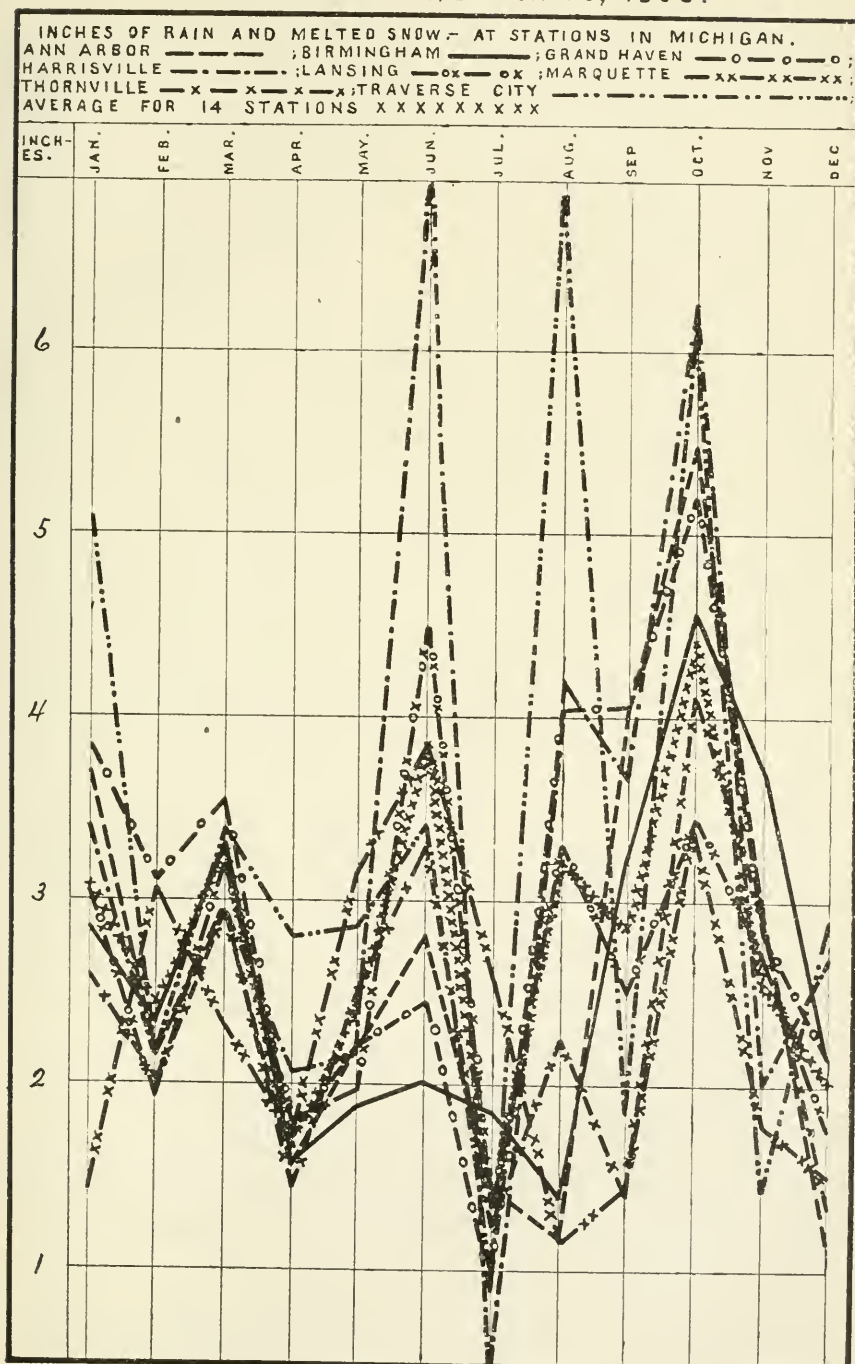


TABLE VIII.—*Relative amount of ozone in the atmosphere by day, for months and year 1898, at 11 stations, also average lines for 8 stations and for 2 stations in Michigan, as indicated by averages of observations made daily by exposing test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 degrees of coloration of the test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Weather Bureau.**

Stations in Michigan.† (Those of the U. S. Weather Bureau in italics.)	Divi- sions of the State. †	Degrees of coloration of test-paper.—Day observation.**													
		Year.		Months, 1898.											
		Norm. ‡	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	i Nov.	Dec.
Av. for 8 stations§.	-----	-----	3.57	3.86	4.19	4.04	3.20	3.70	3.12	2.65	3.85	3.16	3.60	3.30	4.14
Av. for 2 stations||	-----	-----	2.86	2.80	3.34	3.46	3.00	3.87	3.93	3.59	3.36	2.20	1.71	1.22	1.80
Rockland	U. P.	5.43 ⁵	4.86	5.89	d 5.59	5.02	3.77	a 4.07	2.94	1.40	4.53	5.78	b 6.41	5.98	b 6.91
Traverse City	N. W.	5.22 ¹⁷	6.36	6.70	6.54	6.60	6.40	6.80	6.67	c 6.13	6.82	5.94	5.79	5.71	6.18
Harrisville	N. E.	3.66 ¹⁴	2.83	3.15	3.26	2.73	2.34	2.93	2.77	2.27	3.31	1.94	2.72	3.08	3.47
<i>Grand Haven</i>	W.	-----	3.41	3.35	4.56	4.13	3.80	4.20	4.45	4.09	3.06	1.88	2.47	2.03	2.84
<i>Port Huron</i>	B. & E.	-----	2.31	2.25	2.11	2.79	2.20	3.54	3.40	3.08	3.66	2.51	0.95	0.41	0.76
Thorntown	B. & E.	3.17 ²²	4.00	6.35	6.50	5.50	3.17	3.31	1.94	1.80	2.60	2.14	4.37	4.41	5.95
Alma	C.	-----	2.54	3.09	3.54	3.50	2.67	3.44	2.40	0.46	2.24	2.24	2.34	1.35	3.18
Lansing S. B. } of H.	C.	3.02 ²⁰	2.69	1.73	3.22	3.26	1.94	3.02	2.90	2.46	3.05	3.11	2.63	2.18	2.82
Ann Arbor	S. C.	2.69 ⁶	2.81	1.57	2.51	2.89	3.20	3.31	b 2.91	4.53	5.56	1.58	1.85	c 1.50	2.34
Tecumseh	S. C.	-----	4	4.38	4.18	4.70	4.17	4.38	4.27	3.46	4.34	-----	3.63	3.55	3.56
Birmingham	S. E.	-----	2.43	2.41	2.36	2.82	2.07	2.70	2.40	2.14	2.66	2.51	2.65	2.18	a 2.27

*At the stations of the U. S. Weather Bureau during the year 1898, the observations were made by exposing the test-paper from 8 A. M. to 8 P. M., all 75th Meridian time. The corresponding local time for some of these stations is stated in a foot-note to Table II.

†The names of observers, their places of observation and the counties in which these place are situated, are stated in Exhibit 1. The full names of the divisions and counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

§This line is an average for only the stations from which statements nearly complete were received for every month in the year. It does not include Tecumseh and the Weather Bureau Stations.

||This is an average line for Grand Haven and Port Huron.

¶The average for 9 months is 4.06.

**Allowance made for difference in sensitiveness of test-paper; explained below, "i."

a, b, c. In the columns from January to December, inclusive, the a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 26 days.

i Concerning Ozone Corrections.—It is now believed that the correction (for variation in sensitiveness of different lots of test-paper) applied to the monthly averages in the tables for the day and the night ozone, for the month of November in each of the years 1891, 1892 and 1893, at stations in Michigan and at Lansing, was too great for the day (7 A. M. to 2 P. M.) and .34 for the night ozone (9 P. M. to 7 A. M.). This should be taken into consideration in studying the tables relative to ozone in the annual reports of this board for those years.

Nine lines in this table are represented in Diagram VIII.

TABLE IX.—*Relative amount of ozone in the atmosphere at night for months and year 1898, at 11 stations, also average line for 8 stations and for 2 stations in Michigan—as indicated by averages of observations made nightly by exposing test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.—Recorded according to a scale of 10 degrees of coloration of the test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Weather Bureau.**

Stations in Michigan.† (Those of the U. S. Weather Bureau in italics.)	Divi- sions of the State. ‡	Degrees of coloration of test-paper.—Night observations.**													
		Year.		Months, 1898.											
		Norm. §	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations	-----	-----	3.94	3.91	4.60	4.21	3.83	4.05	3.59	3.15	4.42	3.29	4.12	3.70	4.43
Av. for 2 stations¶	-----	-----	3.24	2.81	3.74	3.37	3.40	3.70	4.05	3.61	4.05	3.20	2.72	1.94	2.26
Rockland	U. P.	6.00 ⁵	5.49	5.63 ^d	5.99	5.83	5.00	4.60 ^a	3.91	2.61 ^b	5.69	6.18	6.82 ^d	6.10 ^c	7.52
Traverse City	N. W.	5.18 ¹⁷	6.03	6.41	6.79	6.79	6.44	6.61	5.64	5.75	5.88	4.18	5.62	5.83	6.44
Harrisville	N. E.	4.16 ¹⁴	3.51	3.15	3.62	3.18	2.74	3.48	3.64	2.67	4.91	3.38	3.59	3.80	3.99
Grand Haven	W.	-----	4.48	3.76	4.90	4.75	4.95	4.83	5.21 ^b	4.77	5.02	3.61	4.32	3.38	4.22
Port Huron	B. & E.	-----	1.99	1.86	2.58	1.99	1.84	2.57	2.88	2.45	3.07	2.78	1.11	0.50	0.30
Thornville	B. & E.	3.98 ²²	5.60	7.57	7.51	6.28	5.70	5.44	4.91	3.96	4.75	3.34	5.36	5.20	7.22
Alma	C.	-----	3.28	3.41	4.19	3.92	3.67	3.99	3.61	1.67	3.91	3.04	3.01	2.60	2.31
Lansing S. B. } of H. }	C.	3.36 ²⁰	2.74	1.57	3.62	2.73	2.54	3.25	2.34	2.67	3.07	2.60	3.20	2.06	3.23
Ann Arbor	S. C.	2.49 ⁶	2.34	1.37	2.33	2.31	2.37	2.54	2.01	3.45	4.07 ^a	1.21	2.49	1.73	2.17
Tecumseh	S. C.	-----	††	4.73 ^a	5.22	5.09	5.30	5.22	5.04	4.67	5.39	-----	4.82	4.46	4.35
Birmingham	S. E.	-----	2.54	2.14	2.76	2.67	2.20	2.51	2.64	2.38	3.04	2.41	2.88	2.30	2.57

*At the U. S. Weather Bureau Stations during the year 1898 the observations were made by exposing the test-paper from 8 P. M. to 8 A. M., 75th meridian time. The corresponding local time for some of these stations is stated in a foot-note to Table II.

†The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I.

‡The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

§Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with December 31, 1898. The small figures above and at the right of the numbers which state the average denote the number of years included in the average.

||This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Tecumseh and the U. S. Weather Bureau Stations.

¶This is an average line for Grand Haven and Port Huron.

**Allowance has been made for difference in sensitiveness in test-paper; explained in foot-note "i," Table VIII.

††The average for 11 months is 4.94.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days.

Nine lines in this table are graphically represented in Diagram IX.

DIAGRAM IX- OZONE, AV. BY NIGHT, MONTHS IN 1898.

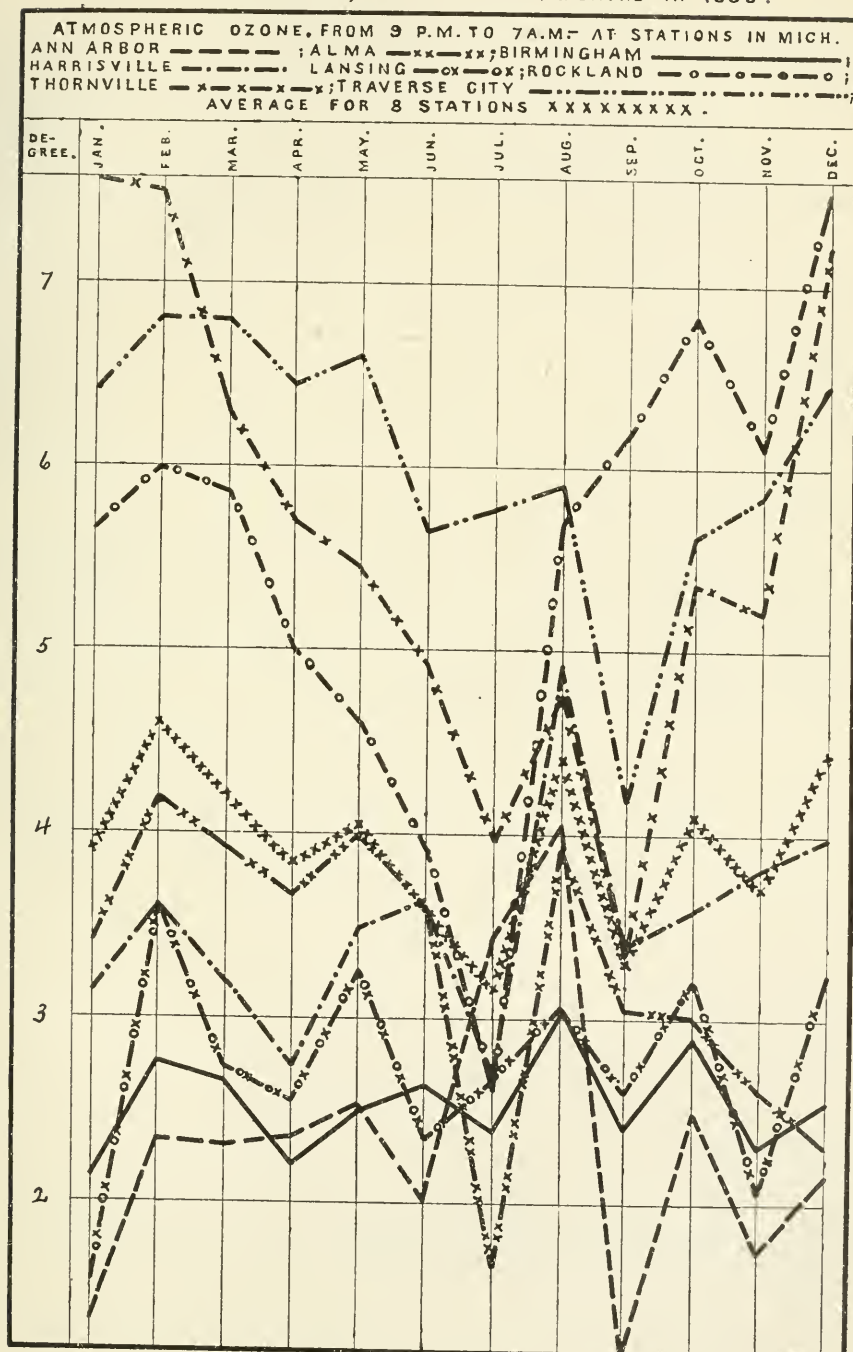


EXHIBIT 23.—Average amount of atmospheric ozone (day), by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Ozone by day.—Degrees of coloration of test-paper.†												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97	3.48	3.71	3.82	3.83	3.63	3.73	3.49	3.03	3.45	3.13	3.17	3.22	3.50
1897 (8 stations) ----	3.67	4.32	4.29	4.13	3.79	4.08	3.73	3.02	3.96	2.64	2.97	3.84	3.73
1898 (8 stations) ----	3.57	3.86	4.19	4.04	3.20	3.70	3.12	2.65	3.85	3.16	3.60	3.30	4.14
In 1898 greater than av. for 21 years, 1877-97.....	.09	.15	.37	.21	-----	-----	-----	-----	.40	.03	.43	.08	.64
In 1898 less than av. for 21 years, 1877-97.....	-----	-----	-----	-----	.43	.03	.37	.38	-----	-----	-----	-----	-----
In 1898 greater than in 1897.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	.52	.63	-----	.41
In 1898 less than in 1897.....	.10	.46	.10	.09	.59	.38	.61	.37	.11	-----	-----	.04	-----

*At from 6 to 20 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 53, report for 1898.

†In this exhibit allowance has been made for difference in sensitiveness of different lots of test-paper.

EXHIBIT 24.—Average amount of atmospheric ozone (night), by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Ozone by night.—Degrees of coloration of test-paper.†												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1877-97	3.68	3.98	4.32	4.29	4.02	3.98	3.70	3.09	3.30	3.01	3.29	3.49	3.90
1897 (8 stations)....	4.10	4.22	4.80	4.73	4.26	4.58	4.23	3.67	4.32	3.04	3.17	3.77	4.41
1898 (8 stations)....	3.94	3.91	4.60	4.21	3.83	4.05	3.59	3.15	4.42	3.29	4.12	3.70	4.43
In 1898 greater than av. for 21 years, 1877-97.....	.26	-----	.28	-----	-----	.07	-----	.06	1.12	.28	.83	.21	.53
In 1898 less than av. for 21 years, 1877-97.....	-----	.07	-----	.08	.19	-----	.11	-----	-----	-----	-----	-----	-----
In 1898 greater than in 1897.....	-----	-----	-----	-----	-----	-----	-----	-----	.10	.25	.95	-----	.02
In 1898 less than in 1897.....	.16	.31	.20	.52	.43	.53	.64	.52	-----	-----	-----	.07	-----

*At from 6 to 20 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 53, report for 1898.

†In this exhibit allowance has been made for difference in sensitiveness of different lots of test-paper.

OBSERVATIONS FOR OZONE AT LANSING.

Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 69, of the Report for 1885, shows that the average for the month for July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M. to 7 A. M., at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying ozone at Lansing through a long period of years.

EXHIBIT 25.—*Average velocity of the wind in miles per hour, by year and months in 1898, compared with annual and monthly averages for 1897, and for the 16 years, 1882-97.* From registers of the Robinson self-registering anemometer.† These averages are for groups of several stations in Michigan.*

Years, etc.	Average miles per hour.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 16 years. 1882-97	9.7	10.8	10.8	10.8	10.5	9.5	7.8	7.8	7.7	8.7	9.6	10.9	10.9
1897 (8 stations)....	9.4	10.8	10.0	10.9	11.0	9.2	7.9	7.3	7.7	7.5	8.6	11.2	10.1
1898 (7 stations)....	9.7	10.8	11.1	10.3	10.0	9.1	8.3	7.3	7.0	8.6	10.2	11.5	12.2
In 1898 greater than av. for 16 years. 1882-97.....	0	0	.3	-----	-----	-----	.5	-----	-----	-----	.6	.6	1.3
In 1898 less than av. for 16 years, 1882-97.....	-----	-----	-----	.5	.5	.4	-----	.5	.7	.1	-----	-----	-----
In 1898 greater than in 1897.....	.3	0	1.1	-----	-----	-----	.4	0	-----	1.1	1.6	.3	2.1
In 1898 less than in 1897.....	-----	-----	-----	.6	1.0	.1	-----	-----	.7	-----	-----	-----	-----

*At from 6 to 9 stations per year for the 16 years, 1882-97.

†Gibbon's anemometer was used at Ann Arbor.

EXHIBIT 26.—*Average velocity of the wind in miles per hour, by months for the 18 years, 1880-97, and comparisons of 1898 with this average and with the year 1897. From registers of the Robinson self-registering anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Miles. by self-registering anemometer.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 18 years. 1880-97	9.8	11.0	11.6	11.3	11.1	9.7	8.2	7.8	7.3	8.4	9.0	11.0	11.0
1897.....	9.7	11.3	11.9	12.1	11.5	9.2	8.9	7.2	7.4	6.5	8.4	11.7	10.5
1898.....	9.7	11.1	11.0	10.8	10.0	8.5	8.4	6.7	6.8	7.9	9.5	12.6	12.7
In 1898 greater than av. for 18 years. 1880-97.....		.1					.2				.5	1.6	1.7
In 1898 less than av. for 18 years. 1880-97.....	.1		.6	.5	1.1	1.2		1.1	.5	.5			
In 1898 greater than in 1897.....	0									1.4	1.1	.9	2.2
In 1898 less than in 1897.....		.2	.9	1.3	1.5	.7	.5	.5	.6				

TABLE X.—Average velocity of the wind in miles per hour for each hour of the day, by months of the year 1898. Compiled from registers of the Robinson self-registering anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Mich.

Months.	Averages.		Hours (1898) and average miles per hour.																															
	Av. 19 Years, 1880-98.	1897.	A. M.												P. M.												A. M.							
			7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year.....	9.8	9.7	9.7	9.7	10.4	11.1	11.7	12.4	12.3	11.9	11.4	10.6	9.9	9.7	9.0	9.0	8.9	8.7	8.5	8.5	8.2	8.2	8.0	8.1	8.4									
Janu ry.....	11.0	11.2	11.1	10.1	10.3	10.8	12.0	13.4	13.9	14.1	13.2	12.9	12.2	11.5	12.2	11.6	10.7	10.7	9.7	9.3	9.2	8.8	9.6	10.0	9.5	10.3	10.8							
February.....	11.6	11.9	*11.0	11.2	11.0	12.1	12.7	13.6	13.4	13.6	12.5	12.2	11.7	10.7	10.2	9.9	9.9	9.6	9.8	9.4	9.7	9.3	9.8	9.6	9.8	10.3	11.0							
March.....	11.3	12.1	†10.8	10.6	11.2	11.7	12.0	12.1	13.2	12.8	12.7	12.3	11.5	10.6	10.6	9.7	9.9	10.3	10.6	10.3	10.0	9.9	9.7	9.7	9.2	9.5								
April.....	11.1	11.5	‡10.0	8.9	9.6	10.5	10.5	11.3	12.9	12.7	12.7	12.2	11.8	10.7	10.1	9.4	9.3	8.9	9.1	8.4	9.0	8.7	8.3	8.4	8.8	8.4	9.1							
May.....	9.6	9.2	8.5	8.6	9.1	9.1	9.6	10.4	11.4	11.3	11.6	11.3	11.0	9.9	9.0	7.2	7.0	7.5	7.6	7.3	6.6	6.3	6.4	7.2	6.3	6.4	6.5							
June.....	8.3	8.5	*8.4	8.6	9.1	10.3	10.6	10.8	11.2	10.9	10.5	10.9	10.6	9.6	8.9	7.5	6.9	7.2	6.6	6.6	6.8	6.2	6.4	6.1	6.2	6.5	6.7							
July.....	7.7	7.2	6.7	6.7	7.1	8.0	8.1	8.5	9.1	8.1	7.7	7.8	7.3	7.6	7.1	6.2	6.6	6.1	5.9	6.0	6.0	6.1	5.7	5.3	5.3	4.7	4.6							
August.....	7.2	7.4	6.8	6.2	6.6	7.0	8.0	8.4	8.8	9.2	9.2	8.5	8.1	7.2	6.1	5.8	6.3	6.6	6.6	6.3	5.8	5.5	5.3	5.4	5.4	5.4								
September.....	8.1	6.5	7.9	7.3	9.0	10.4	11.4	11.8	12.5	12.6	12.2	11.4	9.8	7.4	6.1	6.0	6.2	6.0	6.1	5.2	5.1	5.3	5.7	5.4	5.0	5.1	6.0							
October.....	9.1	8.1	9.5	9.3	9.5	10.5	11.2	11.5	12.5	12.2	11.6	10.0	8.5	7.9	8.9	8.5	9.0	8.7	8.4	8.6	8.6	8.3	8.8	8.9	8.8	9.0	9.2							
November.....	11.1	11.7	‡12.6	11.4	11.5	11.9	12.8	14.5	15.0	14.5	13.9	12.9	12.9	12.6	13.9	13.7	13.4	12.4	12.2	11.6	12.1	12.0	11.3	11.5	11.0	10.5	10.2							
December.....	11.1	10.5	*12.7	12.1	12.4	13.0	13.8	14.0	15.4	15.1	14.2	13.4	12.1	13.0	13.6	12.8	12.9	13.3	12.1	12.4	12.5	11.7	11.6	10.6	10.3	11.1	11.6							

* For only about 26 days. † For only about 30 days. ‡ For only about 27 days. § For only about 25 days. ¶ For only about 29 days.

The statements in the third figure column in Table X., of the average velocity of the wind in miles per hour, by months, during the year 1898, are graphically represented in Diagram XL. The remaining columns of Table X, for 18 8, are graphically represented in Diagram X.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1898.

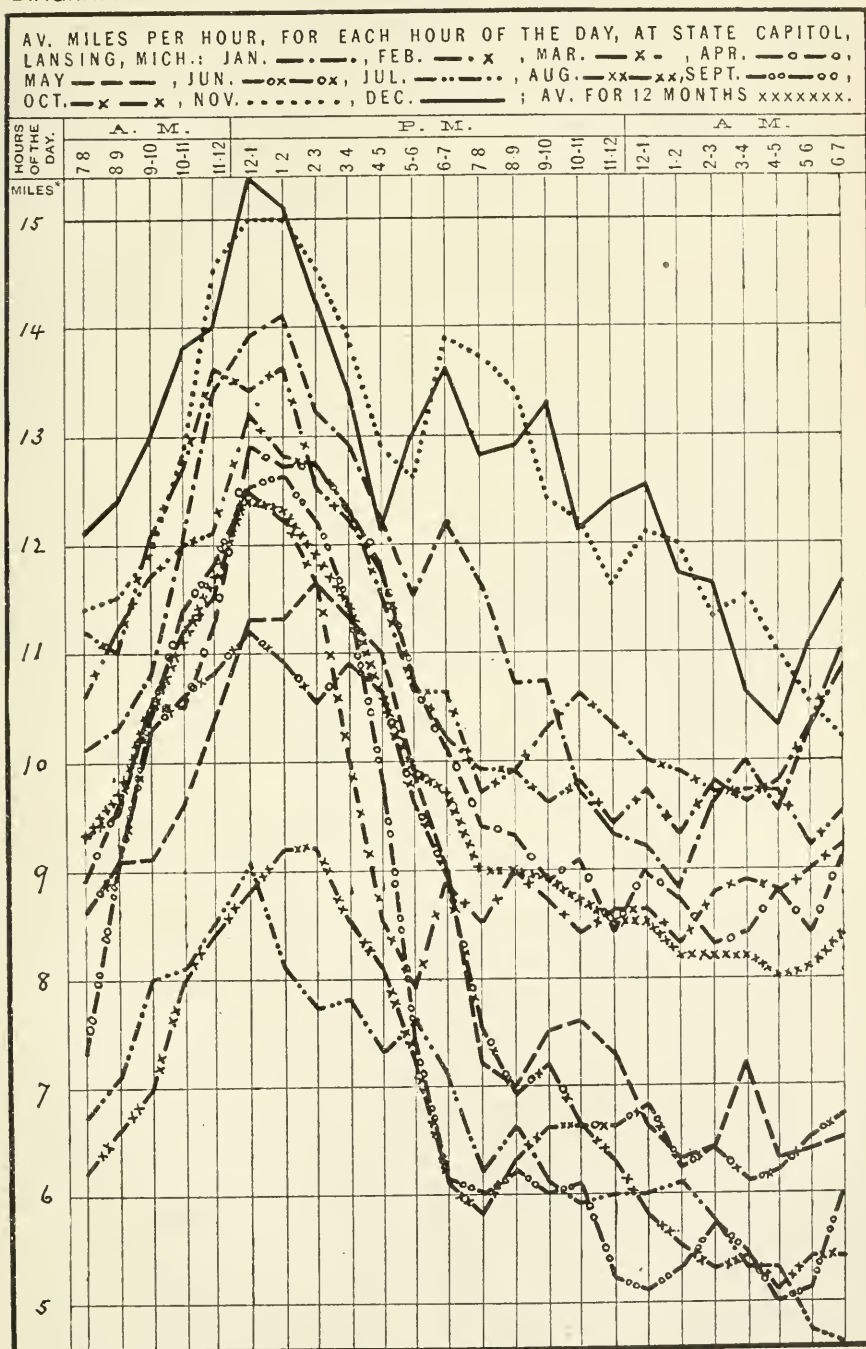


TABLE XI.—Average velocity of the wind in miles per hour for the year and for each month of the year 1898, at 8 stations in Michigan; also average for 7 stations. Computed from registers of the Robinson self-registering anemometer.* by observers for the State Board of Health, and for the U. S. Weather Bureau.

Stations in Michigan.†	Divisions of the State.	Miles, by self-registering anemometer.														
		Year.		Months, 1898.												
				Norm. ‡	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 stations§	•	-----	9.7	10.8	11.1	10.3	10.0	9.1	8.3	7.3	7.0	8.6	10.2	11.5	12.2	
Marquette.....	U. P.	9.6 ¹³	10.4	10.9	11.3	11.8	10.2	9.6	8.9	9.4	7.7	10.3	12.0	11.6	11.1	
Sault Ste. Marie..	U. P.	8.6 ⁷	9.0	8.7	9.7	9.6	9.6	9.4	8.3	7.8	6.8	8.2	11.0	9.6	9.2	
Alpena.....	N. E.	-----	•	9.6	-----	9.9	9.9	9.2	8.4	8.1	6.6	8.5	11.1	-----	10.1	
Grand Haven.....	W.	10.5 ⁹	10.1	11.2	11.7	10.4	9.4	9.2	8.4	7.8	7.6	8.2	10.0	13.4	13.6	
Port Huron.....	B. & E.	10.7 ¹⁷	11.0	12.5	13.1	11.3	11.7	10.5	9.4	8.3	8.4	9.8	11.2	11.8	13.7	
Lansing S. B. of H.....	C.	9.8 ¹⁰	9.7	11.1	11.0	10.8	10.0	8.5	8.4	6.7	6.8	7.9	9.5	12.6	12.7	
Ann Arbor.....	S. C.	8.0 ³	8.1	9.9	9.8	8.5	9.2	7.6	6.2	5.2	5.2	6.5	7.6	10.0	11.3	
Detroit.....	S. E.	9.9 ¹⁷	9.7	11.0	11.0	9.6	9.8	8.7	8.5	6.2	6.5	9.1	10.3	11.6	13.6	

*Gibbon's anemometer was used at Ann Arbor.

†The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

‡Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with December 31, 1898. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

§Not including Alpena.

¶The average for 10 months is 9.1.

Graphic representations of statements made in Table XI. are given in Diagram XI.

Diagrams relating to meteorological conditions.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus in Diagram I., relating to average temperature in 1898, tracing the line "— —" representing Harrisville, it may be seen that the average temperature at Harrisville was, in January, 23°, in March about 33°, in August about 67°, in December about 23°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average lines given in each table are represented in the corresponding diagram by an × line, thus × × × ×. The lines in the diagrams give more ready general comparisons of stations with each other, or of months, with each other, than is possible from the mere numerical statements. By Diagram II., it appears at a glance that the average daily range of temperature at Ann Arbor in 1898 was, during July, greater than at any other of the ten stations represented in that

diagram, and during December was less at Thornville. The marked agreement in the course of lines in Diagram I., representing mean monthly temperature at eight stations, and also that the agreement is closer in October and November than in the other months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., relating to mean temperature by months in 1898, and those in Diagram III., relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 12 m. and 2 p. m., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1898 at Lansing, the months of most wind were November and December. By reference to Diagram XI., it may be seen that at other stations in Michigan where

EXHIBIT 27.—DIRECTION OF WIND, 1878-89.—*Number of observations per month (made tri-daily), at which the wind was blowing from the several (eight) points of compass.—Annual and monthly averages for the 12 years, 1878-89, at stations in Michigan.**

Points of compass.	Average number of observations per month—12 years, 1878 89.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations....	91	93	85	93	90	93	90	93	93	89	92	90	93
Calm	5	4	4	4	4	5	6	8	8	6	5	4	4
North	7	6	6	10	9	8	7	8	8	6	8	6	6
Northeast	8	6	7	10	11	11	9	8	10	7	8	7	5
East	6	5	6	7	8	8	6	5	6	6	5	5	5
Southeast	9	9	9	9	11	11	10	8	9	11	9	7	8
South	10	11	10	7	8	10	11	10	10	12	12	11	11
Southwest	17	22	16	12	12	15	16	18	17	18	18	19	23
West	14	16	14	14	11	12	13	16	12	12	13	17	17
Northwest	14	15	13	19	16	13	11	13	13	12	14	15	14

*At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885; 16 in 1886; 17 in 1887; 13 in 1888, and 11 in 1889.

Graphic representations of statements made in Exhibit 27, are given in Diagram XIII.

DIAGRAM XIII.—WIND, DIRECTION, IN MICH., AVERAGE 12 YEARS, 1878-1889.



* SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION
[Plate 675.]

records of actual miles of wind traveled were kept, December was in 1898 the month of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams.

Diagrams XII., XIII., XIV. and XV., relating to the direction of the wind, are constructed on a plan different from that of the other diagrams. A description of the plan of their construction, method of reading, etc., is printed on page 62 of the annual report for 1898, and in preceding reports.

TABLE XII.—*Number of observations per month (at 7 A. M., 2 P. M. and 9 P. M., daily), at which the wind was blowing from each of the 8 principal points of compass, during the year and during each month of the year 1898. Average for 8 stations in Michigan.**

Points of compass.	Average number of observations per month, 1898.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations (8 stations).....	99	92	83	93	90	92	88	91	92	88	92	90	92
Calm.....	7	5	6	7	9	9	9	11	8	9	7	3	2
North.....	8	5	8	6	14	12	8	9	11	7	7	4	7
Northeast.....	8	7	9	5	15	13	10	5	7	5	6	5	6
East.....	4	4	1	3	4	5	6	7	5	3	5	3	3
Southeast.....	10	12	10	13	10	9	6	14	9	9	19	10	3
South.....	9	10	10	12	4	8	8	9	7	9	8	13	7
Southwest.....	23	22	21	22	9	15	24	10	23	28	20	33	34
West.....	10	11	7	13	7	8	10	9	10	9	7	9	16
Northwest.....	12	18	12	12	18	12	8	7	13	9	15	10	14

*The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1.

Graphic representations of statements in Table XII, are given in Diagram XIV.

DIAGRAM XIV.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1898.

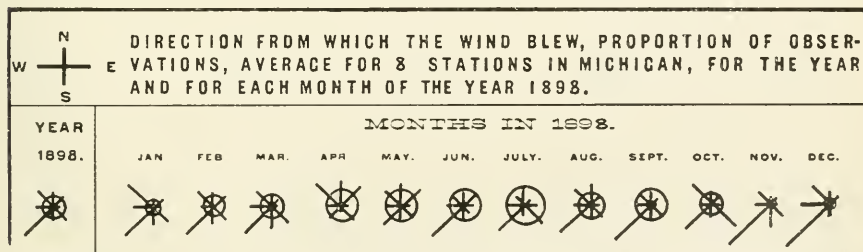


TABLE XIII.—Average number of observations per month for the year 1898, at which the wind was blowing from each of the 8 principal points of the compass, at each of 8 stations* in Michigan; also the average line for the 8 stations.

Stations in Michigan.*	Divisions of the State,†	Average number of observations per month, 1898.									
		All obs.	Calms.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 8 stations.....		90	7	8	8	4	10	9	23	10	12
Rockland.....	U. P.	90	7	9	4	11	12	10	12	13	12
Traverse City.....	N. W.	90	11	21	5	2	8	18	13	6	6
Harrisville	N. E.	91	0	0	11	0	17	0	45	1	17
Thornville.....	B. & E.	91	0	1	14	6	16	4	24	13	13
Alma.....	C.	90	24	3	6	3	3	2	29	9	11
Lansing, S. B. of H.....	C.	91	0	8	7	3	15	12	17	12	16
Ann Arbor.....	S. C.	90	3	8	9	5	8	10	24	13	11
Birmingham.....	S. E.	88	11	15	5	4	4	14	16	10	10

*The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

†The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

Graphic representations of statements in Table XIII, are given in Diagram XV.

DIAGRAM XV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1898.

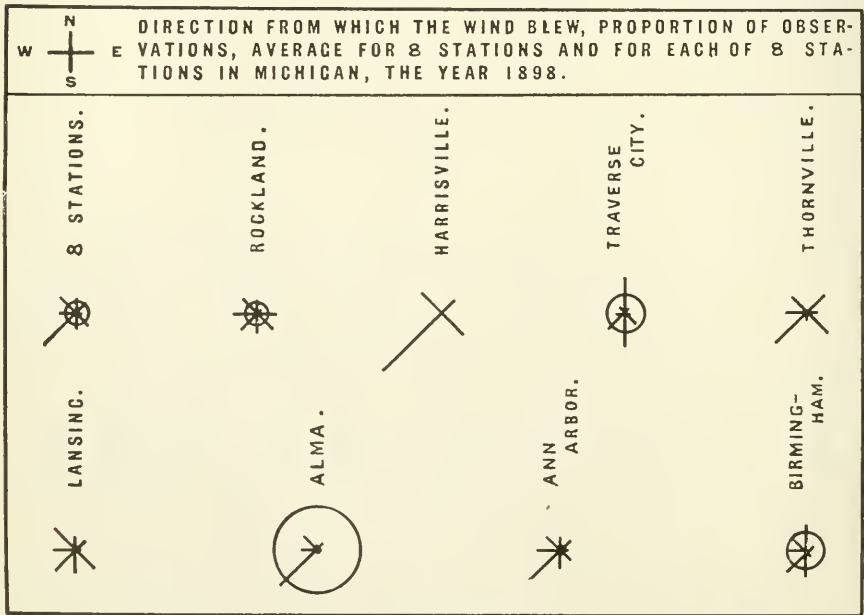


TABLE XIV.—Number of observations for months and year 1898, at which the wind was blowing from each of the 8 principal points of the compass, at 10 stations* in Michigan; also average line for 8 of the said stations from which nearly complete observations were received for the year. (Observations were made at 7 A. M., 2 P. M. and 9 P. M., daily.)

Stations in Michigan.*	Divisions of the State.*	January.										February.										March.									
		Total.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
		Calm.										Calm.										Calm.									
Av. 8 stations†	-----	92	5	5	7	4	12	10	22	11	18	83	6	8	9	1	10	10	21	7	12	93	7	6	5	3	13	12	22	13	12
Rockland.....	U. P.	93	2	0	9	0	20	15	25	10	12	79	2	2	4	0	25	5	28	4	9	93	4	1	2	4	15	10	29	6	21
Traverse City....	N. W.	93	7	17	3	4	18	19	10	1	14	84	5	18	8	2	13	19	12	4	3	93	7	16	8	3	8	21	13	11	6
Harrisville.....	N. E.	93	0	0	9	0	3	0	49	0	32	84	0	0	16	0	7	0	41	3	17	93	0	0	10	0	10	1	57	1	14
Thornville.....	B. & E.	93	0	0	8	3	21	1	28	15	17	84	0	1	14	1	10	2	25	11	20	93	2	1	11	3	22	4	20	21	9
Alma.....	C.	93	30	3	9	1	3	5	19	6	17	84	31	8	6	0	2	3	23	6	5	93	39	6	3	0	3	3	7	17	15
Lausling, S. B. { of H.....}	C.	93	0	5	6	3	18	11	16	15	19	84	0	8	5	0	14	15	14	9	19	93	0	4	2	3	22	14	15	15	18 *
Ann Arbor.....	S. C.	91	0	4	7	10	10	7	14	22	17	84	0	9	9	2	8	15	19	11	11	93	0	9	4	7	11	22	18	15	7
Battle Creek....	S. C.	93	7	8	1	3	6	24	16	24	4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	91	1	9	7	5	15	26	10	11	7
Tecumseh.....	S. C.	93	10	3	9	2	4	1	31	5	28	84	12	3	9	0	15	2	24	2	17	93	15	0	6	2	11	9	26	8	16
Birmingham....	S. E.	90	2	11	5	7	3	18	14	16	14	81	6	16	7	4	2	22	5	9	10	93	4	14	1	4	9	23	13	17	8

* Names of observers, etc., are given in Exhibit 1. Names of divisions, etc., are given in Exhibit I., in a paper which follows, on weekly reports of sickness.
† This line includes only the 8 stations, at which observations were made tri-daily, and from which statements complete, or nearly complete, were received for every month of the year. It does not include Battle Creek and Tecumseh.

Graphic representations of statements for eight lines in this table are given in Diagram XII., which is explained on page 62 of the annual report for 1898, and in preceding reports.

TABLE XIV.—CONTINUED.—*Direction of wind, months in 1898.—Observations at which the wind was blowing from direction named.*

Stations in Michigan.*	Divi- sion of the State.*	April.						May.						June.																				
		Total.		N.	N.E.	E.	S.E.	S.S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.S.W.	W.	N.W.						
Av. 8 stations†.		90	9	14	15	4	10	4	9	7	18			92	9	12	13	5	9	8	15	8	12	88	9	8	10	6	8	24	10	8		
Rockland.....	U. P.	90	22	7	1	0	1	6	21	13	19			91	10	5	0	19	2	1	4	31	19	90	10	5	2	10	8	20	4	23	8	
Traverse City....	N. W.	89	8	37	5	1	8	11	4	5	10	92	17	92	17	36	3	2	2	14	9	3	6	89	13	28	7	3	4	12	12	4	6	
Harrisville.....	N. E.	90	0	2	16	0	20	0	19	3	30	93	0	93	0	1	19	0	29	0	31	2	11	90	0	0	20	0	13	0	48	0	9	
Thornville.....	B. & E.	90	0	2	40	9	13	0	4	6	16	93	0	93	0	4	35	3	13	11	10	5	12	90	0	0	12	14	9	4	23	19	9	
Alma.....	C.	90	24	5	13	3	9	0	7	9	20	93	30	93	30	1	11	5	3	2	27	0	14	76	19	3	8	4	0	30	6	6		
Lausling, S. B. of H.....	C.	90	0	17	16	4	11	7	4	6	25	93	0	93	0	17	12	5	11	12	13	7	16	90	0	7	5	11	11	10	25	14	7	
Ann Arbor.....	S. C.	90	3	18	16	6	7	4	9	12	15	93	3	93	3	10	18	2	11	7	21	9	12	90	8	6	16	1	5	4	37	7	6	
Battle Creek.....	S. C.	90	0	20	23	7	4	14	2	5	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tecumseh.....	S. C.	90	6	5	19	2	7	5	8	7	31	93	15	93	15	8	12	3	7	17	13	3	15	90	18	7	10	4	3	11	26	4	7	
Birmingham.....	S. E.	88	12	26	9	8	8	5	6	5	9	90	15	90	15	23	5	7	4	19	8	6	3	85	18	13	7	6	0	12	14	5	10	

*† These foot-notes are at bottom of first page of this table.

Graphic representations of statements for eight lines in this table are given in Diagram XII., which is explained on page 62 of the annual report for 1898, and in preceding reports.

TABLE XIV.—CONTINUED.—Direction of wind, months in 1898.—Observations at which the wind was blowing from direction named.

Stations in Michigan.*	Divi- sions of the State.*	July.							August.							September.																	
		Calm.		N. N.E.		E.		S. E.		S. S.W.		W.		N.W.		Total.		Calm.		N. N.E.		E.		S. E.		S. S.W.		W.		N.W.		Total.	
Av. 8 stations†		91	11	9	5	7	14	9	20	9	7	92	8	11	7	5	9	7	23	10	13	88	9	7	5	3	9	9	28	9	9		
Rockland.....	U. P.	93	10	6	0	10	21	9	5	29	3	93	10	12	0	16	15	7	2	16	15	89	7	21	0	20	5	20	5	3	8		
Traverse City....	N. W.	86	18	19	4	0	4	17	18	3	3	93	18	29	4	2	4	17	10	4	5	90	18	8	5	1	4	23	13	14	4		
Harrisville.....	N. E.	93	0	0	6	0	32	1	40	1	13	93	0	0	19	0	22	0	37	0	15	90	0	0	2	0	14	1	60	0	13		
Thornville.....	B. & E.	90	0	4	9	10	29	7	19	4	8	93	0	4	10	14	10	1	26	14	14	90	0	0	8	1	17	4	33	16	11		
Alma.....	C.	93	29	2	5	12	3	1	30	1	10	93	19	3	4	3	2	0	28	18	16	90	26	0	1	1	2	0	44	14	2		
Lansing, S. B. of H.....	C.	93	0	14	9	6	19	15	12	11	7	93	0	5	9	1	7	9	28	12	22	90	0	2	6	0	20	12	18	11	21		
Ann Arbor.....	S. C.	93	10	16	0	16	4	13	14	16	4	90	3	15	4	2	4	9	32	13	8	78	4	7	10	0	10	5	26	5	11		
Battle Creek.....	S. C.																																
Tecumseh.....	S. C.	93	20	9	7	10	5	15	19	1	7	93	22	5	7	3	2	17	17	6	14												
Birmingham.....	S. E.	87	21	12	10	2	0	9	19	6	8	90	15	19	3	2	4	15	22	5	5	86	19	16	6	2	2	6	21	9	5		

*† These foot-notes are at bottom of first page of this table.

Graphic representations of statements for eight lines in this table are given in Diagram XII., which is explained on page 62 of the annual report for 1898, and in preceding reports.

TABLE XIV.—CONCLUDED.—*Direction of wind, months in 1898.—Observations at which the wind was blowing from directions named.*

Stations in Michigan.*	Divi- sions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. 8 stations.....		92	7	7	6	5	19	8	20	7	15	90	3	4	5	3	10	13	23	9	10	92	2	7	6	3	3	7	34	16	14
Rockland.....	U. P.	89	4	12	13	16	10	7	8	4	15	90	5	19	4	23	9	12	7	4	7	90	3	20	14	10	7	10	8	7	11
Traverse City....	N. W.	93	6	23	3	3	15	23	10	6	4	90	5	6	7	1	14	27	17	5	8	93	8	11	3	1	5	14	29	15	7
Harrisville.....	N. E.	93	0	0	5	0	30	0	41	0	17	90	0	0	8	0	17	1	55	2	7	93	0	0	4	0	1	0	62	2	24
Thornville.....	B. & E.	93	0	1	5	5	33	3	21	8	17	90	0	0	8	0	10	8	44	15	5	93	0	0	5	4	5	0	39	23	17
Alma.....	C.	93	34	0	3	4	9	1	30	1	11	90	7	2	2	0	0	5	57	10	7	93	1	8	3	0	2	4	46	22	7
Lansing, S. B. { of H.....	C.	93	0	4	5	3	34	9	9	13	16	90	0	3	3	0	15	21	25	12	11	93	0	7	6	3	3	14	25	19	16
Ann Arbor.....	S. C.	93	0	3	9	5	13	11	24	9	19	90	0	1	5	0	8	13	33	16	14	93	0	2	5	5	1	10	39	18	13
Battle Creek....	S. C.	92	5	2	7	5	16	12	24	13	8	90	2	4	3	3	6	20	27	21	4	93	3	9	5	1	5	1	26	35	8
Tecumseh.....	S. C.	93	11	6	3	6	6	27	14	5	15	90	15	1	5	0	2	27	21	9	10	93	3	5	3	3	0	25	30	11	13
Birmingham.....	S. E.	89	9	16	3	5	4	11	13	11	17	87	5	3	5	2	5	15	27	6	19	90	2	9	4	1	1	7	26	23	17

*† These foot-notes are at bottom of first page of this table.

Diagram XII. exhibits lines showing, by months, directions of wind at each of eight stations in this table; for each month and station the diagram represents the figures given in this table for the same month and stations; it is explained on page 62 of the annual report for 1898, and in preceding reports.

DIAGRAM XII. WIND, DIRECTION, AT STATIONS, BY MONTHS, 1898.

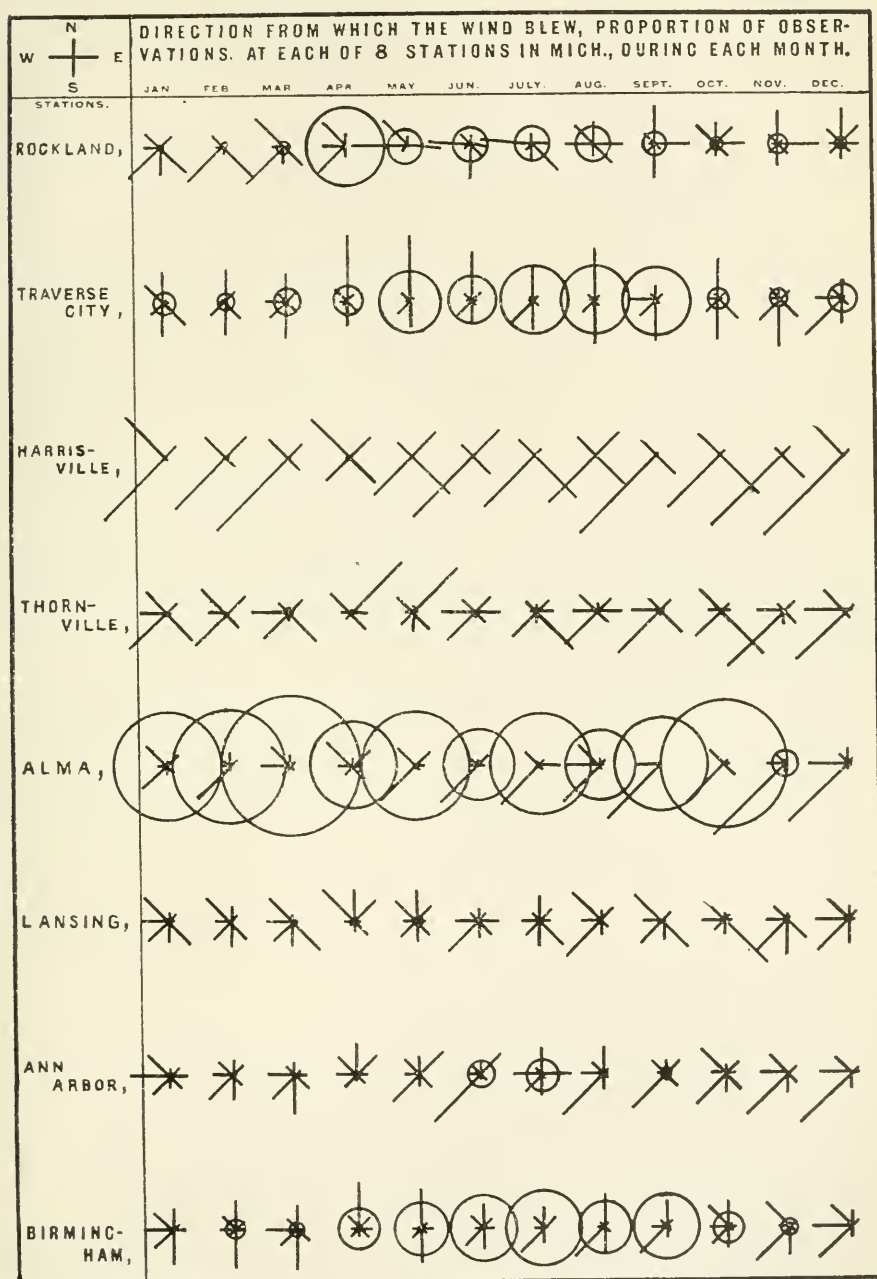


TABLE XV.—Average daily range of atmospheric pressure (as determined from three daily observations) for months and year 1898, at 10 stations, also average line for 8 stations* in Michigan—stations arranged in order by latitude, those farthest north first.

Stations in Michigan.*	Average daily range of barometer—Year and months, 1898.														
	Norm. †	1897.	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations ‡.	-----	.212	.215	.368	.229	.232	.192	.155	.164	.116	.134	.180	.211	.305	.293
Rockland.....	² .228	.241	.215	.269	^e .256	.222	.181	^b .183	.180	.167	^a .143	^c .201	^e .246	.280	^c .255
Traverse City.....	¹⁷ .214	.204	.216	.339	.211	.253	^c .181	.162	.219	^c .128	.139	.188	.199	.295	.273
Harrisville.....	⁴ .215	.216	.214	.353	.213	.252	.187	.146	.181	.115	^a .125	.165	.215	.293	.321
Alma.....	-----	.237	.384	.242	.251	.197	.162	.172	.110	^b .102	.152	^c .197	.210	.344	.418
Thornville.....	¹⁵ .214	.213	.211	.396	.237	.220	.190	.138	.132	^b .102	^c .150	.171	.202	.313	.282
Lansing, S. B. of H.	¹⁷ .205	.206	.201	.364	.219	.215	.193	.137	.141	.100	.121	.160	.197	.301	.259
Birmingham.....	¹² .212	.221	.220	^c .421	^e .230	.238	.211	^b .155	^d .155	^d .118	.124	.188	^a .216	^b .316	^a .270
Battle Creek.....	-----	.211	^f .416	-----	.157	.151	-----	-----	-----	-----	-----	-----	.111	.208	.170
Ann Arbor.....	¹⁷ .206	.213	.206	.415	.220	.207	.197	.155	.135	^b .091	^b .121	.169	.199	.299	.264
Tecumseh.....	-----	.193	[§] .356	.211	^b .219	.189	.126	.115	.087	^a .105	-----	-----	.184	.295	.239

*The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1. The average atmospheric pressure at each of these stations, by months, in 1898, is given in Table XVII.

†Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1898. The small figures above and at the right of numbers which state the average daily range denote the number of years included in the average.

‡Not including Battle Creek and Tecumseh.

§The average for 6 months is .202. §For 11 months, .183.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 19 days.

NOTE.—The latitude and elevations of some of the stations in Table XV. are stated in Exhibit 2.

The daily range is found by subtracting the lowest observation from the highest observation, 7 A. M. to 7 A. M.

TABLE XVI.—*Range of atmospheric pressure (as determined from three daily observations) for the year and for each month and for the average month of the year 1898, at 8 and at each of the 8 stations, and average line for 8 stations in Michigan; also the normal—average monthly range for a series of years. Stations named in order by latitude, those farthest North first.*

Stations in Michigan.	Range of barometer.—Year and months, 1898.															
	Norm. *	1897.	1898.	Av. Month.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
For 8 stationst.	-----	-----	1.942	1.594	1.828	1.507	1.571	1.483	1.445	1.611	1.392	1.132	1.841	1.694	1.725	1.904
Av. for 8 sta- tions†-----	-----	-----	1.472	.878	1.240	.832	.859	.835	.687	.931	.598	.493	.991	.894	1.005	1.174
Rockland -----	.998 ²	1.536	1.322	.961	1.054	.862	.915	.883	.869	.987	.731	.504	1.251	1.032	1.192	1.257
Traverse City --	.952 ¹⁷	1.486	1.431	.853	.937	.681	.772	.761	.711	1.173	.593	.582	.967	.849	1.000	1.214
Harrisville -----	.925 ⁴	1.405	1.306	.876	1.104	.739	.838	1.062	.647	.980	.627	.469	.871	.974	1.051	1.155
Alma -----	-----	-----	1.483	.846	1.146	.742	.821	.791	.638	.838	.583	.467	1.009	.924	1.074	1.122
Thornville -----	.943 ¹⁵	1.525	1.548	.876	1.374	.915	.919	.726	.615	.918	.581	.573	.970	.824	.967	1.130
Lansing, S. B. { of H. -----	.905 ¹⁷	1.481	1.440	.853	1.246	.854	.829	.829	.627	.889	.554	.451	.964	.884	.958	1.155
Birmingham -----	.921 ¹²	1.686	1.532	.870	1.341	.953	.935	.851	.611	.823	.585	.463	.965	.837	.888	1.193
Battle Creek -----	-----	1.512	-----	§	1.424	-----	.625	.582	-----	-----	-----	-----	-----	.713	.719	.876
Ann Arbor -----	.907 ¹⁷	1.489	1.714	.888	1.714	.906	.839	.773	.776	.843	.532	.433	.933	.831	.907	1.165
Tecumseh -----	-----	1.400	-----	||	1.029	.928	.894	.824	.598	.865	.474	.358	-----	.808	.895	1.152

*Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with December 31, 1898. The small figures above and at the right of the numbers which state the average denote the number of years included in the average.

†Represents the difference between the highest of 8 stations and the lowest of 8 stations for year and for each month of year, not including Battle Creek and Tecumseh.

‡Represents sum of ranges at 8 stations divided by 10.

§The average for 6 months is .823. ||For 11 months, .802.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c., etc., stand directly above the numbers from which they refer to notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 20 days.

NOTE.—The statement in the star (*) foot-note to Table XV. apply also to Table XVI.

EXHIBIT 28.—*Average atmospheric pressure, by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 21 years, 1877-97.* These averages are for groups of several Stations in Michigan.*

Years, etc.	Average atmospheric pressure.—Inches of mercury.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years. 1877-97	29.133	29.151	29.150	29.130	29.121	29.092	29.094	29.110	29.132	29.174	29.152	29.147	29.147
1897 (10 stations)	29.073	29.076	29.069	29.063	29.100	29.035	29.022	29.000	29.047	29.215	29.127	29.073	29.045
1898 (9 stations)	29.080	29.026	29.091	29.149	29.123	29.021	29.068	29.127	29.069	29.098	29.088	29.072	29.029
In 1898 greater than av. for 21 years, 1877-97	-----	-----	-----	.019	.002	-----	-----	.017	-----	-----	-----	-----	-----
In 1898 less than av. for 21 years, 1877-97	.053	.125	.059	-----	-----	.071	.026	-----	.063	.076	.064	.075	.118
In 1898 greater than in 1897	.007	-----	.022	.086	.023	-----	.046	.127	.022	-----	-----	-----	-----
In 1898 less than in 1897	-----	.050	-----	-----	-----	.014	-----	-----	-----	.117	.039	.001	.016

*At from 7 to 20 stations per year for the 21 years, 1877-97. Just which stations in each year, up to 1897, are shown on page 75, report for 1898.

DIAGRAM XVI.—ATMOSPHERIC PRESSURE, BY MONTHS, 1898.

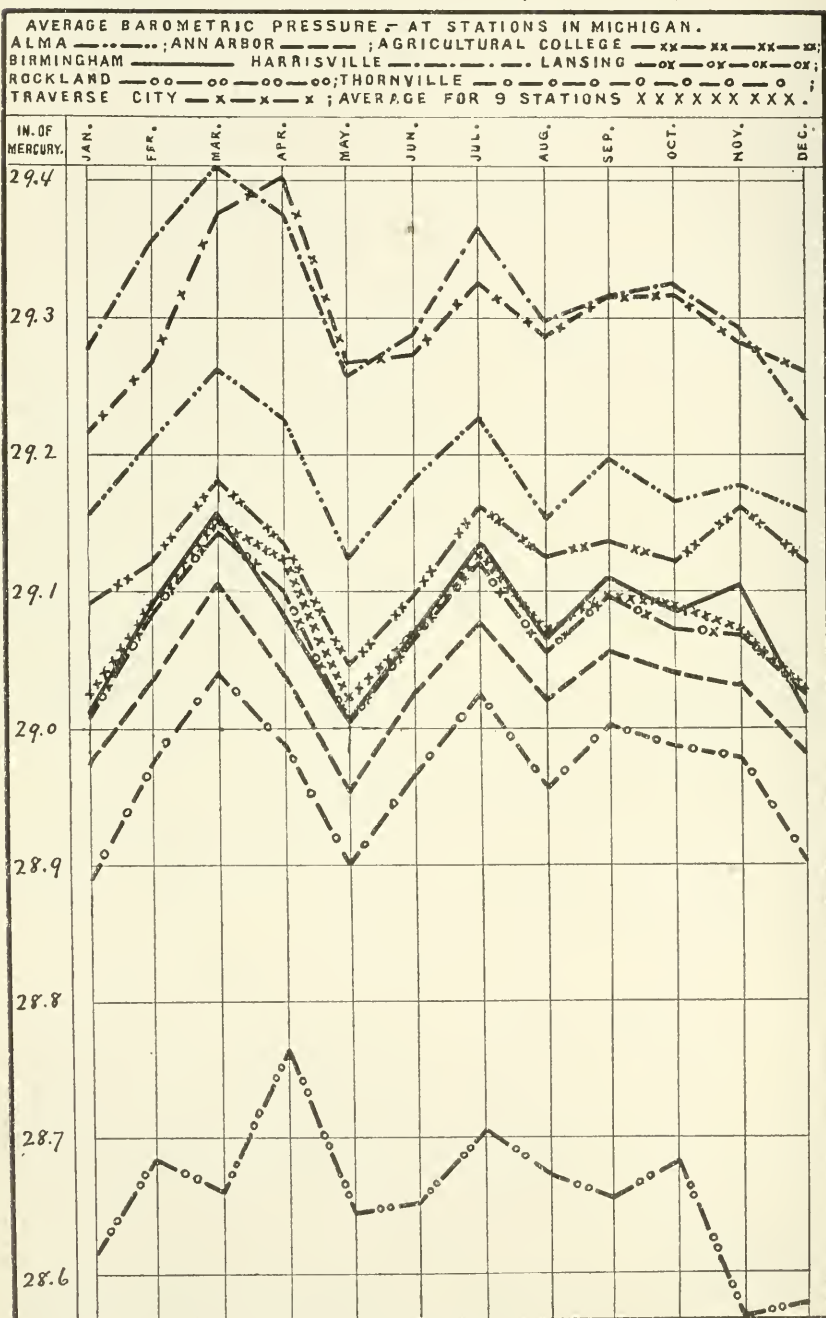


TABLE XVII.—Average atmospheric pressure for months and year 1898, at each of 11 stations in Michigan; also averages for 9 stations; as indicated by the height, in inches, of Mercury in the barometer. Corrected for temperature.—Reduced to 32° F. (For some stations not corrected for instrumental errors).—Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M. by observer† for the State Board of Health.

Stations in Michigan.†	Divisions of the State.‡	Inches of Mercury.—Atmospheric pressure.													
		Years.		Months, 1898.											
		Norm.§	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations||			29.080	29.026	29.091	29.149	29.123	29.021	29.068	29.127	29.069	29.068	29.072	29.029	
Rockland.....	U. P.		28.656	28.615	28.683 ^e	28.659	28.763 ^c	28.643 ^b	28.652	28.705 ^c	28.671 ^a	28.654 ^b	28.681 ^c	28.578 ^c	
Traverse City.....	N. W.	29.323 ¹⁷	29.298	29.216	29.266	29.375	29.402	29.265	29.272	29.326	29.285	29.314	29.310	29.259	
Harrisville.....	N. E.	29.327 ⁴	29.315	29.276	29.355	29.410	29.373	29.256	29.287	29.365	29.297 ^a	29.317 ^b	29.323	29.225	
Thornville.....	B. & E.	28.954 ⁹	28.967	28.888	28.973	29.039	28.987	28.900	28.966	29.026	28.955	29.003 ^b	28.986	28.902	
Agricultural College.....	C.	29.081 ¹⁷	29.124	29.060	29.121	29.180	29.134	29.044	29.096	29.160 ^a	29.125	29.135	29.122	29.121	
Alma.....	C.		29.186	29.154	29.209	29.261	29.226	29.123	29.181	29.227	29.152	29.198	29.164	29.157	
Lansing, S. B. of H.....	C.	29.062 ¹⁰	29.070	29.008	29.084	29.142	29.099	29.003	29.065	29.121	29.054 ^a	29.097	29.071	29.024	
Ann Arbor.....	S. C.	29.633 ¹⁵	29.628	28.973 ^f	29.037	29.107	29.037	28.954	29.026	29.076	29.020	29.056	29.039	28.980	
Battle Creek.....	S. C.		28.891 ^e			29.376 ^a	29.328						29.333	29.278	
Tecumseh.....	S. C.		**	29.068 ^b	29.145 ^d	29.211	29.142	29.083 ^c	29.141 ^c	29.182 ^b	29.117 ^a		29.156 ^a	29.113 ^a	
Birmingham.....	S. E.	29.107 ¹²	29.077	29.011	29.089	29.156	29.082	29.006	29.067	29.134 ^b	29.064	29.110	29.086 ^b	29.103 ^b	

* A correction has been made for instrumental error of barometer at Ann Arbor; .004 has been added to each monthly average during the year 1898. For other stations the instrumental error of barometer is not known.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I.

‡ The full names of divisions and the counties in each division are stated in Exhibit I, in preceding reports.

§ Numbers in this column state the average annual atmospheric pressure for periods of years ending in each case with December 31, 1898. The small figures at the right of the numbers which state the average denote the number of years included in the average.

|| This line is an average for 9 stations, at which observations were made tri-daily, and from which reports, nearly complete, were received for every month in the year. It does not include Battle Creek and Tecumseh. Green's standard barometer was used at all the 11 stations for 1898.

¶ The average for 6 months is 29.257. ** For 11 months, 29.136.

NOTE.—(Computations of monthly averages for the year 1898 were furnished by the observers at Ann Arbor and the Agricultural College. The remainder of the computations were made at the office of the State Board of Health.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days.

The average line and lines for nine stations in this table are graphically represented in Diagram XVI.

EXHIBIT 29.—Average daily range of atmospheric pressure, by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 16 years, 1882-97*. These averages are for groups of several stations in Michigan.

Years, etc.	Average daily range of barometer.—Year and months, 1898.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 16 years, 1882-97	.211	.297	.302	.265	.216	.168	.134	.126	.132	.168	.207	.251	.266
1897 (10 stations)...	.212	.247	.234	.366	.241	.183	.131	.094	.128	.152	.215	.281	.267
1898 (8 stations)....	.215	.368	.229	.232	.192	.155	.164	.116	.134	.180	.211	.305	.293
In 1898 greater than av. for 16 years, 1882-97.....	.004	.071	-----	-----	-----	-----	.030	-----	.002	.012	.004	.054	.027
In 1898 less than av. for 16 years, 1882-97.....	-----	-----	.073	.033	.024	.013	-----	.010	-----	-----	-----	-----	-----
In 1898 greater than in 1897.....	.003	.121	-----	-----	-----	-----	.033	.022	.006	.028	-----	.024	.026
In 1898 less than in 1897.....	-----	-----	.005	.134	.049	.028	-----	-----	-----	-----	.004	-----	-----

*At from 8 to 18 stations per year for the 16 years, 1882-97. Just which stations in each year, up to 1897, are shown on page 78, report for 1898.

EXHIBIT 30.—Range of atmospheric pressure, by year and months, in 1898, compared with annual and monthly averages for 1897, and for the 16 years, 1882-97.* These averages are for groups of several stations in Michigan.

Years, etc.	Range of barometer.—Year and months, 1898.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 16 years, 1882-97	.955	1.273	1.306	1.140	1.043	.803	.689	.583	.613	.795	1.005	1.109	1.125
1897 (10 stations)---	.934	1.323	1.024	1.394	1.109	.798	.521	.491	.670	.668	1.039	1.099	1.070
1898 (8 stations)----	.878	1.240	.832	.859	.835	.687	.931	.598	.493	.991	.894	1.005	1.174
In 1898 greater than av. for 16 years, 1882-97-----							.242	.015		.196			.049
In 1898 less than av. for 16 years. 1882-97-----	.077	.033	.474	.281	.208	.116			.120		.111	.104	
In 1898 greater than in 1897-----							.410	.107		.323			.104
In 1898 less than in 1897-----	.056	.083	.192	.535	.274	.111			.177		.145	.094	

*At from 8 to 18 stations per year for the 16 years, 1882-97. Just which stations in each year, up to 1897, are shown on page 78, report for 1898.

Sunshine and clouds.

On the back of each blank register supplied by this Board to observers, on which they are to register meteorological data, is a statement that "One observer has reported a record of days 'all or nearly all cloudy' and days 'all or nearly all sunshine.' The State Board of Health would be glad to have such a report from all observers who can conveniently make it. Memoranda may be made in a column headed 'cloudy or sunny,' days more than 80 per cent of clouds being marked with the abbreviation 'C,' indicating *cloudy*, and days with less than 20 per cent of clouds with an 'S,' indicating *sunshine*."

EXHIBIT 31.—*Statements of the number of days in each month which were reported "sunny," "partly cloudy," and "cloudy," by observers at stations in Michigan.*

Stations in Michigan.	1898.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Lansing.....	S.	4	2	10	9	10	11	20	8	14	4	4	3
	P. C.	8	8	5	11	12	13	6	8	12	8	6	9
	C.	19	18	16	10	9	6	5	15	4	19	20	19
Rockland.....	S.	8	9	16	16	13	16	17	10	22	6	9	5
	P. C.	4	4	5	5	6	6	11					
	C.	19	13	10	9	11	8	3	21	8	25	21	26
Marquette.....	S.	2	3	6	10	7	5	7	5	8	4	3	2
	P. C.	8	2	9	14	10	11	13	16	11	6	3	12
	C.	21	23	16	6	14	14	11	10	11	21	24	17
Sault Ste. Marie.	S.	2	1	6	15	11	9	11	8	8	4	3	2
	P. C.	7	9	13	8	7	11	17	14	14	7	7	5
	C.	22	18	12	7	13	10	3	9	8	20	20	24
Thornville.....	S.	7	10	15	15	14	15	22	16	21	9	12	4
	P. C.	8	4	6	7	8	9	7	6	5	9	2	5
	C.	16	14	10	8	9	6	2	9	4	13	16	22
Alma.....	S.	15	3	14	15	13	16	24	13	16	9	13	21
	P. C.	9											
	C.	16	16	17	15	18	14	7	18	14	22	17	10
Ann Arbor.....	S.	6	2	12	9	8	12	23	20	22	3	7	4
	P. C.	8	9	7	10	18	15	6	7				8
	C.	17	17	12	11	5	3	2	4	8	19	23	19
Detroit.....	S.	4	5	9	10	11	12	16	11	13	3	4	2
	P. C.	6	5	5	11	11	12	10	10	12	12	11	9
	C.	21	18	17	9	9	6	5	10	5	16	15	20
Alpena.....	S.	3	2	10	9	11	9	16	10	15	5	6	1
	P. C.	14	11	10	12	8	15	13	12	10	10	8	11
	C.	14	15	11	9	12	6	2	9	5	16	16	19
Port Huron.....	S.	2	7	13	11	12	12	17	11	15	2	7	3
	P. C.	12	9	8	8	12	14	13	16	8	17	9	11
	C.	17	12	10	11	7	4	1	4	7	12	14	17

THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICK- NESS.

A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF SICKNESS
IN MICHIGAN DURING THE YEAR 1898, AND PRECEDING YEARS.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE
BOARD OF HEALTH.

This paper is the twenty-second in a series of articles upon the same general subject begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1898. It includes a series of graphic illustrations which show by months, in 1898, the rise and fall of twenty-eight of the most prominent diseases in Michigan.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of each of the more important diseases in the State, and to note the connection of this prevalence with each of the meteorological conditions in the State.

Tables are given showing the per cent of the weekly *reports* and the per cent of *observers* which stated the presence of the various diseases; and by comparing Table 1 with Exhibit I, we see the correspondence in the two lines of evidence,—that of the “prevalence” of the diseases as shown by the per cent of *reports*, and the “area of prevalence” as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1898.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For these reasons the State Board of Health undertakes, by a compilation of the weekly reports of sickness in connection with the

various meteorological conditions, to learn what constant, and, therefore, probably causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of each disease in certain months as compared with other months in the same year, or with the same month in other years or series of years.

To facilitate the study of the causes of sickness and deaths, the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit I., in preceding reports. On pages 201 and 217 of the report of this Board for 1886, the divisions and the counties in each were indicated by lines on maps of the State.

Physicians should have compensation for weekly reports of sickness.

Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; a few health officers have slight pay from their local boards of health. Each one should have full compensation. No other class of persons has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

Plan of the weekly card reports.

The plan of the weekly reports remains the same as last year. (Cards having *pleuritis* printed on them were first used for weekly reports in October, 1887.) Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in sickness in 1898, when compared with the average for the twenty-one years, 1877-97, as shown in Exhibits VIII and X, on subsequent pages. Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked 4, and the following week, with the same number of cases, be marked 1. Names of diseases printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in and vicinity.
 PLEASE DATE.
 Week ending Sat.,, 19

DISEASES. CASES OBSERVED.

Ed. 44.

	Prevalence order. See a.	No. of cases.
Brain, inflammation of	14	1
Bowels, inflammation of	12	3
Bronchitis.....	11	4
Cerebro-spinal meningitis.....	0	0
Cholera infantum.....	8	9
Cholera morbus.....	10	6
Consumption, pulmonary.....	10	6
Croup, membranous.....	12	3
Diphtheria.....	5	14
Diarrhea.....	3	17
Dysentery.....	8	9
Erysipelas.....	13	2
Fever, intermittent.....	2	21
Fever, remittent.....	11	4
Fever, typhoid (enteric).....	0	0
Fever, typho-malarial.....	9	7
Influenza.....	7	11
Kidney, inflammation of.....	14	1
Measles.....	1	27
Neuralgia.....	14	1
Pleuritis.....	0	0
Pneumonia.....	9	7
Puerperal fever.....	0	0
Rheumatism.....	6	12
Scarlet fever.....	4	16
Smallpox.....	0	0
Tonsillitis.....	11	4
Whooping-cough.....	0	0
<i>Mumps</i>	6	12
<i>Dyspepsia</i>	11	4

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record book cover.] A blank indicates that the item has been overlooked. Please mail this, ~~and~~ signed and dated, ~~as~~ as soon as convenient after close of week specified.

REMARKS.—If this report includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.

M. D.

Bulletins of "Health in Michigan."

During the year 1898 the issue of the weekly and monthly bulletins of "Health in Michigan" has been continued. These bulletins are compiled from the regular weekly card reports of physicians in all parts of the State, and from the health officers' reports of communicable diseases, which reports are made to the Secretary of the State Board of Health in compliance with law.

The bulletins give to the members of the State Board of Health, local health officers, and when published to the public, information concerning the "diseases which cause most sickness" in the State, the relative amount of sickness from each disease, and comparisons with the preceding week or month, thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a comparison of the various meteorological conditions; also (in the monthly bulletin) a comparison with the average month for a series of years, also (in the weekly bulletin) lists of the localities in which each of the dangerous communicable diseases is reported present, which lists if widely published would serve to put people intending to visit such places on their guard against such diseases.

As a rule, about five-eighths of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletins. It is found that the statements made in the monthly bulletins are corroborated by the information, after the close of the year, from the compilation of the whole number of the reports for the corresponding months of the year.

The bulletins are an immediate ephemeral use of some of the data supplied by the reports from localities, which data finally go to make up the permanently-valuable sickness statistics, and the communicable-disease statistics of Michigan; but even this ephemeral use has been the means of disseminating among the people of Michigan much information useful for the restriction and prevention of sickness and deaths.

A copy of the weekly bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part, in their papers; and copies of the monthly bulletin have been sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health.

There are about 1,589 cities, villages, and townships in Michigan, each of which is required by law to have a health officer, and nearly every one of them contributes some fact, and some of them very many facts, useful for the promotion of the public health. The State Board of Health serves to collect these facts, group them so as to make them most useful, and give them all out again to every locality for the general good.

Annual compilation of the weekly reports.

The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of prevalence of the diseases for that time. There is also found for each locality what per cent of the reports states the presence of each disease for the given month. This per cent of reports for a single locality indicates what portion of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3 is made by months for the State, so far as it is represented by the localities from

which reports are received, showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

Diseases from which there was a marked increase or decrease in prevalence in Michigan in 1898.

By referring to Exhibit I., it will be seen that there was no disease which showed a marked increase in 1898 over the average for the twenty-one years, 1877-1897; the diseases in which the decrease in 1898 appears most marked, when compared with the above-mentioned average, are intermittent fever, remittent fever, pneumonia, typhoid fever, typho-malarial fever, diphtheria, consumption, erysipelas, scarlet fever, dysentery, cholera morbus, cholera infantum, inflammation of bowels, whooping-cough, and measles.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to under the head, "Plan of the weekly card reports," on page 59.

A comparison of 1898 with the average for the twelve years, 1886-1897, shows that there was no disease which showed a marked increase in 1898; the diseases in which the decrease appears most marked in 1898, when compared with the last-named average, are intermittent fever, remittent fever, typhoid fever, typho-malarial fever, whooping-cough, consumption, pneumonia, scarlet fever, cholera infantum, cholera morbus, inflammation of bowels, erysipelas, dysentery and diphtheria.

Method of comparison of diseases by years, months, and weeks.

In the annual reports ending with that for 1888, mention was made of diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the disease in the current year and in the preceding year or term of years; in the reports since that for 1888 those diseases were mentioned of which the comparison showed an increase or decrease of twenty-five per cent from the preceding year, or from the normal, as the case may be.

In this report, those diseases which are reported by seven or more observers, and which show an increase or decrease of twenty-five per cent are generally mentioned, except in cases of cholera, smallpox, typhus fever or other particularly interesting or dangerous disease, and these are specially considered in each instance.

EXHIBIT I.—*Stating, for each of 13 years, 1886–1898, the number of reports received, and on what per cent of these reports each of 28 diseases was stated to be present; also an average for the period of 21 years, 1877–1897, and an average for the period of 12 years, 1886–1897. The diseases are arranged in the order of greatest area of prevalence in 1898. (Continued for each month of 1897 and 1898 on the two pages following.)*

Line number.	Diseases.	What per cent of the reports stated the presence of the disease.														
		Av. 1877-97. †	Av. 1886-97.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
	Av. Disease*.....	26	22	17	18	18	20	20	20	21	25	25	23	24	25	26
1	Rheumatism.....	67	66	62	66	60	60	62	64	64	69	71	65	66	69	70
2	Neuralgia.....	63	61	54	58	54	56	56	57	61	66	67	63	62	67	67
3	Bronchitis.....	58	55	49	50	51	52	50	53	54	60	65	58	59	55	56
4	Influenza.....	41	42	45	47	44	44	41	43	42	55	53	32	32	33	35
5	Tonsillitis.....	47	46	40	43	45	43	42	49	48	49	50	46	41	47	49
6	Diarrhea.....	44	42	36	34	34	42	40	40	43	47	44	45	41	48	45
7	Consumption, pul....	51	41	20	20	23	29	36	38	38	49	52	48	49	51	55
8	Intermittent fever...	51	33	19	17	19	22	24	24	27	36	41	43	45	48	54
9	Inflam. of kidney....	20	19	17	17	16	20	17	17	21	20	21	20	19	18	20
10	Pneumonia.....	30	24	17	19	18	21	20	22	25	27	30	26	30	28	27
11	Pleuritis.....	17	-----	15	18	16	17	13	14	18	21	19	17	18	-----	-----
12	Remittent fever....	35	24	13	11	16	20	20	18	21	28	27	30	34	32	34
13	Erysipelas.....	20	18	12	14	12	13	13	14	16	19	21	22	24	24	23
14	Dysentery.....	17	15	12	12	11	15	14	13	15	16	16	17	17	19	17
15	Cholera morbus.....	16	15	12	10	11	15	14	14	15	16	15	14	15	19	17
16	Inflam. of bowels....	14	13	10	10	10	11	13	12	13	15	14	14	14	16	17
17	Cholera infantum....	12	11	8	8	8	12	12	10	11	13	10	11	11	13	14
18	Typhoid fever (ent.)	11	10	8	7	10	13	11	9	9	11	8	10	10	10	8
19	Measles.....	11	9	7	13	7	4	6	7	4	10	12	6	16	14	6
20	Scarlet fever.....	14	10	5	4	8	12	14	10	12	9	10	10	9	8	11
21	Whooping-cough....	15	11	5	4	7	9	12	9	10	9	9	16	9	14	20
22	Diphtheria.....	14	7	3	5	5	5	7	7	7	6	8	6	7	10	13
23	Typho-mal. fever....	14	8	2	0.9	2	4	4	4	5	6	7	16	15	16	16
24	Inflam. of brain....	5	4	2	2	3	3	3	3	3	4	5	5	5	6	5
25	Puerperal fever....	4	4	2	2	2	2	2	3	4	3	4	5	4	6	5
26	Cerebro-spi. men....	3	2	2	1	1	0.8	1	2	2	3	3	3	3	3	4
27	Membran. croup....	4	3	0.5	0.7	1	2	2	2	3	4	4	3	4	4	5
28	Smallpox.....	0.8	0.5	.04	.05	4	0.3	0.6	0.3	.02	0	0.1	.03	.03	.02	0.4
No. of reports received.		4,540	4,935	5,219	4,418	3,940	4,395	5,572	5,853	5,281	4,291	4,939	5,000	5,047	4,896	5,583

*The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year) what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month.

†Footnote on page 77.

‡Average per year.

EXHIBIT I.—CONTINUED.—*Stating for each of 28 diseases by months, on what per cent also the average by months for the period of 21 years,*

What per cent of the reports received stated presence of the disease.																									
Line number.	January.								February.								March.								
	Diseases.				Diseases.				Diseases.				Diseases.				Diseases.				Diseases.				
	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	
	Average disease*	26	23	17	18	Average disease*	27	22	18	18	Average disease*	27	24	17	19	Average disease*	27	24	17	19	Average disease*	27	24	17	19
1	Rheumatism	70	68	68	67	Rheumatism	70	68	70	65	Rheumatism	70	72	73	65	Rheumatism	70	72	73	65	Rheumatism	70	72	73	65
2	Neuralgia	67	66	66	59	Influenza	66	69	67	72	Influenza	64	68	69	67	Influenza	64	68	69	67	Influenza	64	68	69	67
3	Influenza	62	65	66	63	Neuralgia	68	67	65	58	Neuralgia	71	69	67	66	Neuralgia	71	69	67	66	Neuralgia	71	69	67	66
4	Bronchitis	71	67	50	59	Tonsillitis	59	57	54	53	Bronchitis	72	68	54	63	Bronchitis	72	68	54	63	Bronchitis	72	68	54	63
5	Tonsillitis	58	57	50	57	Bronchitis	73	69	51	66	Tonsillitis	58	57	48	50	Tonsillitis	58	57	48	50	Tonsillitis	58	57	48	50
6	Pneumonia	54	42	32	31	Pneumonia	53	44	34	35	Pneumonia	51	42	28	34	Pneumonia	51	42	28	34	Pneumonia	51	42	28	34
7	Pleuritis	24	22	22	22	Pleuritis	24	24	21	21	Pleuritis	26	23	23	25	Pleuritis	26	23	23	25	Pleuritis	26	23	23	25
8	Diarrhea	26	26	22	14	Diarrhea	27	26	22	19	Diarrhea	28	27	20	19	Diarrhea	28	27	20	19	Diarrhea	28	27	20	19
9	Inflam. of kidney	20	20	19	15	Inflam. of kidney	22	21	17	14	Inflam. of kidney	22	21	19	17	Inflam. of kidney	22	21	19	17	Inflam. of kidney	22	21	19	17
10	Consumption, pul.	52	43	14	22	Consumption, pul.	53	42	16	20	Consumption, pul.	54	44	17	23	Consumption, pul.	54	44	17	23	Consumption, pul.	54	44	17	23
11	Erysipelas	23	19	13	13	Erysipelas	24	21	13	15	Erysipelas	24	21	17	23	Erysipelas	24	21	17	23	Erysipelas	24	21	17	23
12	Intermittent fev.	41	27	12	12	Intermittent fev.	42	27	11	12	Intermittent fev.	44	29	14	10	Intermittent fev.	44	29	14	10	Intermittent fev.	44	29	14	10
13	Measles	9	7	10	8	Inflam. of bowels	12	11	8	7	Measles	15	13	11	17	Measles	15	13	11	17	Measles	15	13	11	17
14	Inflam. of bowels	12	11	10	6	Remittent fev.	28	20	7	9	Inflam. of bowels	13	12	9	7	Inflam. of bowels	13	12	9	7	Inflam. of bowels	13	12	9	7
15	Remittent fev.	29	21	9	10	Measles	12	11	6	12	Remittent fev.	29	20	8	9	Remittent fev.	29	20	8	9	Remittent fev.	29	20	8	9
16	Scarlet fev.	17	12	7	4	Diphtheria	15	7	6	6	Typhoid fev. (ent.)	5	4	6	3	Typhoid fev. (ent.)	5	4	6	3	Typhoid fev. (ent.)	5	4	6	3
17	Typhoid fev. (ent.)	9	7	6	3	Scarlet fev.	16	10	5	5	Dysentery	7	6	6	6	Dysentery	7	6	6	6	Dysentery	7	6	6	6
18	Diphtheria	18	9	5	8	Cerebro-spi. men.	3	2	4	4	Whooping-cough	14	10	5	2	Whooping-cough	14	10	5	2	Whooping-cough	14	10	5	2
19	Dysentery	6	6	4	4	Cerebro-spi. men.	3	2	4	4	Diphtheria	13	6	4	5	Diphtheria	13	6	4	5	Diphtheria	13	6	4	5
20	Whooping-cough	14	10	4	3	Dysentery	6	6	3	3	Puerperal fever	5	4	3	4	Puerperal fever	5	4	3	4	Puerperal fever	5	4	3	4
21	Typho-mal. fever	11	5	2	0	Inflam. of brain	5	5	3	3	Scarlet fev.	17	11	3	1	Scarlet fev.	17	11	3	1	Scarlet fev.	17	11	3	1
22	Cholera morbus	3	3	2	1	Whooping-cough	15	10	2	2	Cholera morbus	4	3	2	3	Cholera morbus	4	3	2	3	Cholera morbus	4	3	2	3
23	Inflam. of brain	4	4	1	2	Cholera morbus	4	3	2	2	Cerebro-spi. men.	4	3	2	2	Cerebro-spi. men.	4	3	2	2	Cerebro-spi. men.	4	3	2	2
24	Cerebro-spi. men.	3	3	2	1	Puerperal fever	5	4	2	2	Inflam. of brain	5	4	2	2	Inflam. of brain	5	4	2	2	Inflam. of brain	5	4	2	2
25	Membran. croup	9	5	1	2	Membran. croup	7	4	1	0.5	Typho-mal. fever	9	5	2	0.7	Typho-mal. fever	9	5	2	0.7	Typho-mal. fever	9	5	2	0.7
26	Puerperal fever	5	4	1	3	Typho-mal. fever	9	5	0.8	0.3	Membran. croup	6	4	1	1	Membran. croup	6	4	1	1	Membran. croup	6	4	1	1
27	Cholera infantum	2	1	1	0	Cholera infantum	1	1	0.5	0.3	Cholera infantum	2	1	0.7	0.2	Cholera infantum	2	1	0.7	0.2	Cholera infantum	2	1	0.7	0.2
28	Smallpox	1	0.4	0	0	Smallpox	1	0.7	0	0	Smallpox	0.7	0.5	0.2	0	Smallpox	0.7	0.5	0.2	0	Smallpox	0.7	0.5	0.2	0
	Reports received§	381	409	338	377	Reports received§	349	382	373	387	Reports received§	368	399	151	438	Reports received§	368	399	151	438	Reports received§	368	399	151	438
Line number.	April.								May.								June.								
	Diseases.				Diseases.				Diseases.				Diseases.				Diseases.				Diseases.				
	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	
	Average disease*	26	23	18	18	Average disease*	24	22	15	17	Average disease*	23	20	14	16	Average disease*	23	20	14	16	Average disease*	23	20	14	16
1	Rheumatism	73	72	66	65	Rheumatism	70	69	61	66	Rheumatism	66	65	59	68	Rheumatism	66	65	59	68	Rheumatism	66	65	59	68
2	Influenza	55	58	65	65	Neuralgia	64	63	53	61	Neuralgia	61	58	46	54	Neuralgia	61	58	46	54	Neuralgia	61	58	46	54
3	Neuralgia	69	67	58	66	Influenza	40	41	50	45	Influenza	50	47	38	46	Influenza	50	47	38	46	Influenza	50	47	38	46
4	Bronchitis	68	65	56	60	Bronchitis	58	56	47	46	Bronchitis	27	26	32	29	Bronchitis	27	26	32	29	Bronchitis	27	26	32	29
5	Tonsillitis	53	53	46	46	Tonsillitis	46	46	38	45	Tonsillitis	39	37	32	34	Tonsillitis	39	37	32	34	Tonsillitis	39	37	32	34
6	Pneumonia	44	36	29	27	Consumption, pul.	53	43	32	22	Consumption, pul.	51	41	29	27	Consumption, pul.	51	41	29	27	Consumption, pul.	51	41	29	27
7	Pleuritis	22	22	22	26	Pneumonia	32	27	20	24	Diarrhea	41	38	29	27	Diarrhea	41	38	29	27	Diarrhea	41	38	29	27
8	Consumption, pul.	56	45	22	21	Diarrhea	33	30	24	19	Intermittent fev.	56	35	17	18	Intermittent fev.	56	35	17	18	Intermittent fev.	56	35	17	18
9	Inflam. of kidney	23	23	18	17	Intermittent fev.	54	34	19	13	Inflam. of kidney	21	20	16	19	Inflam. of kidney	21	20	16	19	Inflam. of kidney	21	20	16	19
10	Intermittent fev.	51	34	17	14	Pleuritis	18	17	19	19	Measles	19	16	14	25	Measles	19	16	14	25	Measles	19	16	14	25
11	Measles	19	16	17	21	Inflam. of kidney	23	22	12	17	Remittent fev.	35	23	12	13	Remittent fev.	35	23	12	13	Remittent fev.	35	23	12	13
12	Diarrhea	30	28	17	20	Erysipelas	23	20	11	16	Pleuritis	14	14	12	13	Pleuritis	14	14	12	13	Pleuritis	14	14	12	13
13	Erysipelas	25	22	15	17	Remittent fev.	33	22	11	11	Erysipelas	21	19	11	13	Erysipelas	21	19	11	13	Erysipelas	21	19	11	13
14	Remittent fev.	32	21	11	11	Measles	12	19	10	32	Inflam. of bowels	14	14	9	11	Inflam. of bowels	14	14	9	11	Inflam. of bowels	14	14	9	11
15	Inflam. of bowels	12	11	9	8	Inflam. of bowels	13	13	9	10	Pneumonia	19	14	9	10	Pneumonia	19	14	9	10	Pneumonia	19	14	9	10
16	Puerperal fever	4	4	5	2	Whooping-cough	15	12	6	5	Cholera morbus	16	14	8	6	Cholera morbus	16	14	8	6	Cholera morbus	16	14	8	6
17	Typhoid fev. (ent.)	4	3	5	0.9	Scarlet fever	15	11	5	3	Cholera infantum	9	8	6	5	Cholera infantum	9	8	6	5	Cholera infantum	9	8	6	5
18	Scarlet fev.	16	12	5	5	Cholera morbus	7	7	4	3	Dysentery	11	10	6	6	Dysentery	11	10	6	6	Dysentery	11	10	6	6
19	Whooping-cough	14	11	5	3	Dysentery	8	7	2	6	Whooping-cough	15	11	4	4	Whooping-cough	15	11	4	4	Whooping-cough	15	11	4	4
20	Inflam. of brain	5	5	3	5	Puerperal fever	4	4	2	3	Cerebro-spi. men.	3	2	3	3	Cerebro-spi. men.	3	2	3	3	Cerebro-spi. men.	3	2	3	3
21	Diphtheria	13	6	3	5	Inflam. of brain	5	4	2	2	Scarlet fev.	13	9	3	5	Scarlet fev.	13	9	3	5	Scarlet fev.	13	9	3	5
22	Cholera morbus	5	4	2	4	Cerebro-spi. men.	4	3	2	3	Diphtheria	10	5	3	3	Diphtheria	10	5	3	3	Diphtheria	10	5	3	3
23	Cerebro-spi. men.	4	2	2	2	Typhoid fev. (ent.)	4	4	2	3	Typhoid fev. (ent.)	5	5	3	5	Typhoid fev. (ent.)	5	5	3	5	Typhoid fev. (ent.)	5	5	3	5
24	Dysentery	7																							

STATISTICAL STUDY OF SICKNESS IN MICHIGAN IN 1898. 65

of the reports received the diseases were stated to be present in each of the years 1897 and 1898; 1877-97, and for the period of 12 years, 1886-97.

What per cent of the reports received stated presence of the disease.																
July.					August.					September.						
Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Line number.	
Average disease*.	25	21	15	17	Average disease*.	27	23	18	18	Average disease*.	28	23	18	19		
Rheumatism.....	61	60	55	67	Diarrhea.....	81	76	65	63	Diarrhea.....	76	72	67	66	1	
Diarrhea.....	67	61	48	46	Rheumatism.....	57	57	55	60	Rheumatism.....	60	60	57	67	2	
Neuralgia.....	57	56	39	53	Neuralgia.....	55	54	46	53	Neuralgia.....	57	55	46	53	3	
Bronchitis.....	41	39	33	35	Bronchitis.....	40	39	33	40	Bronchitis.....	46	44	41	41	4	
Tonsillitis.....	33	33	28	30	Cholera morbus.....	50	45	36	27	Tonsillitis.....	35	35	33	30	5	
Consumption, pul.	49	40	24	23	Dysentery.....	47	41	33	24	Dysentery.....	43	39	33	30	6	
Cholera morbus.....	39	33	23	20	Tonsillitis.....	22	32	29	35	Cholera morbus.....	37	32	23	28	7	
Influenza.....	19	15	8	20	Cholera infantum.....	53	32	26	29	Influenza.....	37	32	23	28	8	
Intermittent fev.	32	28	18	17	Intermittent fev.	32	32	26	29	Intermittent fev.	38	32	23	28	9	
Cholera infantum.....	32	28	18	17	Consumption, pul.	49	40	24	23	Cholera infantum.....	33	32	23	28	10	
Dysentery.....	32	28	18	17	Influenza.....	19	17	20	24	Remittent fev.....	45	31	21	16	11	
Remittent fev.....	37	35	15	16	Remittent fev.....	42	32	18	15	Consumption, pul.	49	39	19	18	12	
Inflam. of kidney.....	18	18	15	23	Inflam. of kidney.....	17	16	17	18	Inflam. of kidney.....	16	15	16	15	13	
Inflam. of bowels.....	16	12	13	16	Inflam. of bowels.....	19	19	15	15	Typhoid fev. (ent.)	19	19	14	10	14	
Pleuritis.....	11	11	10	11	Typhoid fev. (ent.)	13	14	10	12	Inflam. of bowels.....	16	16	14	14	15	
Erysipelas.....	18	15	9	12	Pleuritis.....	9	11	8	11	Erysipelas.....	15	14	9	11	16	
Measles.....	11	9	8	12	Erysipelas.....	16	14	7	12	Pneumonia.....	13	10	6	6	17	
Typhoid fev. (ent.)	7	7	6	4	Whooping-cough.....	17	13	6	8	Pleuritis.....	11	11	8	13	18	
Scarlet fever.....	10	7	5	4	Scarlet fever.....	9	6	4	3	Typho-mal. fev.....	26	15	6	5	19	
Pneumonia.....	13	9	5	3	Measles.....	9	4	4	8	Whooping-cough.....	15	11	4	5	20	
Whooping-cough.....	17	13	5	9	Pneumonia.....	10	8	3	4	Scarlet fever.....	10	7	3	4	21	
Inflam. of brain.....	5	4	3	4	Puerperal fev.....	4	3	3	3	Cerebro-spi. men.....	3	12	3	3	22	
Cerebro-spi. men.....	3	3	3	0.3	Typho-mal. fev.....	17	11	2	2	Diphtheria.....	11	6	3	1	23	
Typho-mal. fev.....	10	6	3	2	Cerebro-spi. men.....	23	12	2	0.3	Measles.....	4	12	12	4	24	
Puerperal fev.....	4	3	2	2	Inflam. of brain.....	5	4	12	3	Inflam. of brain.....	5	4	12	12	25	
Diphtheria.....	10	5	0.7	5	Diphtheria.....	10	6	0.6	2	Puerperal fev.....	4	3	1	1	26	
Membran. croup.....	1	1	0.3	0.3	Membran. croup.....	12	1	0	0	Membran. croup.....	2	1	0	0.5	27	
Smallpox.....	0.8	0.2	0	0	Smallpox.....	0.4	0.1	0	0	Smallpox.....	0.2	0.1	0	0	28	
Reports received\$	398	432	455	351	Reports received\$	414	453	519	336	Reports received\$	394	435	451	292		
October.					November.					December.						
Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Diseases.	Av. '77-97. +	Av. '86-97.	1898. +	1897.	Line number.	
Average disease*.	26	22	18	19	Average disease*.	25	21	17	17	Average disease*.	25	22	18	16		
Rheumatism.....	65	65	62	66	Rheumatism.....	69	65	63	68	Bronchitis.....	67	62	64	53	1	
Neuralgia.....	61	59	54	56	Bronchitis.....	62	58	59	47	Rheumatism.....	70	67	63	66	2	
Bronchitis.....	53	52	43	43	Neuralgia.....	64	62	59	59	Influenza.....	52	55	63	53	3	
Diarrhea.....	53	51	49	58	Influenza.....	41	41	48	40	Neuralgia.....	65	63	60	61	4	
Tonsillitis.....	44	43	40	38	Tonsillitis.....	53	52	47	46	Tonsillitis.....	57	56	50	46	5	
Influenza.....	32	31	31	34	Diarrhea.....	33	36	28	34	Diarrhea.....	26	25	25	22	6	
Intermittent fev.....	58	36	25	24	Consumption, pul.	49	32	22	14	Pneumonia.....	37	30	22	20	7	
Dysentery.....	32	23	21	23	Intermittent fev.....	19	12	19	19	Inflam. of kidney.....	19	19	21	18	8	
Consumption, pul.	49	38	19	16	Inflam. of kidney.....	19	12	19	19	Consumption, pul.	49	39	20	13	9	
Inflam. of kidney.....	18	17	18	17	Pneumonia.....	28	32	16	17	Pleuritis.....	20	11	17	19	10	
Remittent fev.....	43	30	18	13	Pleuritis.....	17	11	15	16	Erysipelas.....	21	19	14	14	11	
Cholera morbus.....	14	13	16	21	Erysipelas.....	19	17	13	14	Remittent fev.....	31	22	13	5	12	
Typhoid fev. (ent.)	21	20	15	14	Remittent fev.....	36	25	13	10	Intermittent fev.....	42	27	12	13	13	
Cholera infantum.....	12	11	12	17	Typhoid fev. (ent.)	18	17	13	12	Inflam. of bowels.....	13	12	11	11	14	
Erysipelas.....	12	15	12	13	Scarlet fever.....	14	11	6	6	Scarlet fever.....	15	12	11	11	15	
Pleuritis.....	13	11	11	15	Whooping-cough.....	13	9	7	5	Typhoid fev. (ent.)	12	10	11	11	16	
Pneumonia.....	18	15	11	10	Inflam. of bowels.....	12	11	6	7	Whooping-cough.....	13	9	11	11	17	
Inflam. of bowels.....	14	13	10	13	Dysentery.....	10	9	5	9	Diphtheria.....	18	9	5	5	18	
Typho-mal. fev.....	28	16	6	6	Diphtheria.....	19	10	5	6	Typho-mal. fev.....	14	6	4	0.8	19	
Scarlet fever.....	13	10	5	3	Typho-mal. fev.....	20	10	4	0	Dysentery.....	6	6	6	4	20	
Diphtheria.....	17	10	4	6	Cholera morbus.....	6	5	3	5	Measles.....	6	5	5	9	21	
Whooping-cough.....	13	9	2	4	Inflam. of brain.....	4	3	0.2	2	Cholera morbus.....	4	4	4	4	22	
Puerperal fev.....	4	3	1	2	Puerperal fev.....	4	3	1	2	Inflam. of brain.....	4	4	4	4	23	
Cerebro-spi. men.....	3	3	1	0.6	Cerebro-spi. men.....	3	2	0.8	0.9	Cerebro-spi. men.....	3	2	1	1	24	
Membran. croup.....	4	3	0.5	0.6	Cholera infantum.....	3	3	0.6	2	Cholera infantum.....	4	2	0.3	0.3	25	
Inflam. of brain.....	4	4	0.2	3	Membran. croup.....	6	4	0.4	0.9	Puerperal fev.....	4	3	0.3	1	26	
Smallpox.....	0.3	0.2	0	0	Measles.....	5	4	0	7	Membran. croup.....	7	4	0	1	27	
					Smallpox.....	0.4	0.2	0	0	Smallpox.....	0.4	0.2	0	0	28	
Reports received\$	406	439	418	345	Reports received\$	384	423	481	322	Reports received\$	388	416	394	399		

state how many reports were received for the month in the given years. article.

EXHIBIT II.—*By months and by geographical divisions of the State*, the names of 217 observers, whose weekly reports of diseases for 1898 are compiled in Tables 1, 2, 3 and 4, the localities* for which they report, and the number of reports received from each observer.*

Divisions and localities represented and physicians who reported. (Those not health officers in italics.)	Weekly reports in 1898.—Compiled in this article.												
	Year, 1898.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All localities.....	5,219	338	373	451	337	446	556	455	519	451	418	481	394
Upper Peninsula Division.....	269	19	26	38	21	19	26	24	23	16	17	23	17
Bessemer, G. L. Loope, M. D.	25	4	4	5	4	4	4						
Escanaba, A. C. Cholette, M. D.	12							4	5	3			
Houghton, H. W. Jones, M. D.	7			4	3								
Iron River, R. H. Sturgeon, M. D.	6	4	2										
Ironwood, J. K. Niven, M. D.	13	4	4	5									
Ironwood, J. C. Yates, M. D.	8												
Ishpeming, G. G. Barnett, M. D.	41			4	2	4	5	4	5	4	4	5	4
Ishpeming, A. E. Gourdeau, M. D.	12					3	5						
Laurium, D. K. McQueen, M. D.	9	3	3	3									
Marquette, J. H. Dawson, M. D.	3		3										
Newberry, F. W. Neal, M. D.	4			4									
Ontonagon, J. S. Nitterauer, M. D.	8				2	2	4						
Rockland Tp., W. C. Gates, M. D.	29				3	2	3	4	3	3	3	4	4
Sault Ste. Marie, B. D. Harrison, M. D.	45		2	5	4	4	5	4	5	4	4	5	3
St. Ignace, J. F. Darby, M. D.	14	4	4	3	3								
Wakefield, J. H. Eddy, M. D.	33		4	5				4	5	2	4	5	4
Northwestern Division.....	284	20	20	24	13	26	28	26	26	28	20	33	20
Bear Lake, C. W. Tomlin, M. D.	12	4	4	4									
Cadillac, D. Ralston, M. D.	15					2		3		4		4	2
Fife Lake, L. S. Walter, M. D.	47	4	4	5	2	4	5	3	4	4	3	5	4
Kingsley, G. L. Fenton, M. D.	27						5	4	4	2	3	5	4
Lake Ann, W. J. Shilliday, M. D.	5					3		2					
Manistee, E. S. Ellis, M. D.	18							3	4	4	3	4	
Manistee, J. A. King, M. D.	19	4	4	5	4	2							
Manton, T. A. Corlett, M. D.	36				3	4	5	3	4	4	4	5	4
Manton, V. F. Huntley, M. D.	13	4	4	5									
Sherman, E. A. McManus, M. D.	35					4	5	4	5	4	4	5	4
South Frankfort, D. W. Roos, M. D.	8					3	3			2			
Thompsonville, R. McDermott, M. D.	49	4	4	5	4	4	5	4	5	4	3	5	2
Northern Division.....	302	24	25	28	12	15	31	24	27	30	29	29	28
Bellaire, W. S. Bell, M. D.	17								4	4	4	5	
Boardman, S. E. Neihardt, M. D.	21							3	4	4	2	3	2
Boyne City, A. J. DeLacey, M. D.	47	4	4	5	4	4	5	4	5	4	4		4
Cheboygan, W. E. Chapman, M. D.	5		2	3									
Cheboygan, J. W. Steffins, M. D.	23						4	4		3	3	5	4
East Jordan, F. C. Warne, M. D.	44	4	4	5	4	4	5		4	3	4	3	4
Harbor Springs, L. W. Gardner, M. D.	29						3	4	5	4	4	5	4
Harbor Springs, E. A. Runyan, M. D.	7	4	3										
Kalkaska, E. B. Babcock, M. D.	19					3	3	3		4	2		4
Kalkaska, P. W. Pearsall, M. D.	13	4	4	5									
Mancelona, C. A. Johnson, M. D.	25	4	4	5			3	2			2	3	2
Petoskey, O. L. Ramsdell, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Northeastern Division.....	120	8	8	9	4	8	11	9	10	13	15	15	10
East Tawas, H. A. Goodale, M. D.	24	4	4	4			3	2		3	4		
Harrisville, <i>D. W. Mitchell, M. D.</i>	52	4	4	5	4	4	5	4	5	4	4	5	4
Rogers City, C. W. Isaminger, M. D.	28					4	3	3	5	3	3	5	2
West Branch, W. H. Witter, M. D.	16									3	4	5	4
Northern Central Division.....	203	8	10	10	11	18	25	19	29	21	13	21	18
Beaverton, F. S. Pierce, M. D.	21	4	4		3			2				4	4
Big Rapids, W. T. Dodge, M. D.	18					3	5	3	4	3			
Evart, J. M. Wilkinson, M. D.	13					3							2
Gladwin, J. W. Leininger, M. D.	5								5				
Gladwin, C. G. Suylandt, M. D.	4		2			2							
Harrison, E. E. Bracey, M. D.	31						5	4	5	4	4	5	4
Lake City, D. J. Erwin, M. D.	39			5	4	3	5	4	5	4	3	4	2
Meosta, J. Snyder, M. D.	10										2	4	4
Mt. Pleasant, P. E. Richmond, M. D.	2									2			
Rosecommon, J. H. Curnalia, M. D.	21						3	5	2	5	4		2
Shepherd, W. J. Galerno, M. D.	39	4	4	5	4	4	5	4	5	4			

* The counties in each division are shown in Exhibit I, in preceding reports.

a In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

EXHIBIT II.—CONTINUED.

Divisions and localities represented and physicians who reported. (Those not health officers in italics.)	Weekly reports in 1898.—Compiled in this article.												
	Year, 1898.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Western Division	556	25	27	37	36	55	61	42	61	50	47	64	51
Casnovia, C. E. Koon, M. D.	21	4	4	5	4	4							
Custer, A. D. Kibbie, M. D.	42	3	3	5	4	2	3	4	4	4	3	4	3
Grand Haven, A. Van Der Veen, M. D.	11												
Grand Rapids, <i>A. Hazelwood, M. D.</i>	51	4	4	5	4	4	5	4	5	4	4	5	5
Grandville, J. D. Buskirk, M. D.	12	4	4	4									
Grant, P. Drummond, M. D.	5				2	3							
Hart, J. H. Nicholson, M. D.	18								5	4	4	3	2
Hart Tp., J. A. Fleming, M. D.	49	4	4	5	4	4	4	4	3	4	4	5	4
Hesperia, H. C. Hawley, M. D.	18				2	4	5					4	3
Holland, H. Kremers, M. D.	39			3	4	4	3	3	5	4	4	5	4
Lowell, O. C. McDannell, M. D.	30						4	4	5	4	4	5	4
Ludington, E. N. Dundas, M. D.	35					4	5	4	5	4	4	5	4
Luther, E. Fairbanks, M. D.	7											3	4
Luther, E. Treadgold, M. D.	36	2	4	5	4	3	5	4	4	3	2		
Pentwater, C. W. Cramer, M. D.	12					3	4		5				
Rockford, H. O. Sarber, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Sand Lake, C. J. Annes, M. D.	31					3	4	3	5	3	4	5	4
Scottville, E. P. Thomas, M. D.	2					2							
Sparta, B. J. Zudzenze, M. D.	37				2	4	5	4	5	4	4	5	4
White Cloud, W. C. Derby, M. D.	37				2	4	5	4	5	4	4	5	4
Whitehall, L. W. Keyes, M. D.	11					3	4			4			
Central Division.	1,029	66	77	94	71	91	106	86	96	94	84	85	79
Alma, J. F. Suydam, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Bancroft, G. Cosgrove, M. D.	7	3	4										
Belding, I. Ohlinger, M. D.	26				3	3	5	3	3	3	3		3
Bellevue, A. S. Wilson, M. D.	19				3	4	5	2	3	2			
Brighton, H. M. Ptolmey, M. D.	43	3	4	5	3	4		4	4	3	4	5	4
Charlotte, A. R. Stealey, M. D.	33					3	5	4	5	3	4	5	4
Clio, W. H. Taylor, M. D.	29				2	3	4		5	4	4	3	
Evergreen Tp. (Montcalm Co.), W. H. Budd, M. D.	29					4	4	3	3	3	4	4	4
Flint, N. Bates, M. D.	48	4	4	5	2	3	5	4	5	3	4	5	4
Flushing, C. S. Wheeler, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Fowler, E. Schemer, M. D.	21					3	5	4	5	4			
Fowlerville, A. S. Austin, M. D.	10		2	3		3					2		
Gaines, G. H. Alway, M. D.	28	4	4	5	3	4	4	4					
Gaines, E. H. Austin, M. D.	4									4			
Greenville, H. L. Bower, M. D.	29					2	4	2	5	4	3	5	4
Hamburg Tp., J. N. Swartz, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Hastings, G. W. Lowry, M. D.	42	3	4	5	4	3	3	2	3	4	4	4	3
Howard City, J. Totten, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Ionia, L. Joslin, M. D.	25	4	4	5	4							4	4
Laingsburg, R. H. Scott, M. D.	16		3			2	4	2		3			2
Lake Odessa, C. N. Snyder, M. D.	6				3	3							
Lakeview, J. W. Kirtland, M. D.	23				3	3	4	2	3	3	2		3
Laings, P. A. Tyler, M. D.	47	3	4	5	4	3	4	3	5	4	4	5	3
Leslie, M. S. Dowling, M. D.	7				2	2				3			
Linden, M. E. Topping, M. D.	45		4	5	4	4	5	3	4	3	4	5	4
Lyons, D. C. Spalding, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Maple Rapids, A. O. Hart, M. D.	16	4	2	3				3		2	2		
McBride, D. C. Bell, M. D.	51	4	4	5	4	4	5	4	5	4	4	5	3
Middleville, A. L. Taylor, M. D.	8			5							3		
Perrinton, E. C. Van Decor, M. D.	34					3	5	4	5	4	4	5	4
Perry, H. P. Halstead, M. D.	11	3	4	4									
Pottersville, E. R. Espie, M. D.	47	3	3	4	2	4	5	4	5	4	4	5	4
Stanton, N. E. Bachman, M. D.	7						5						2
Stanton, R. L. Bentley, M. D.	16	4	4	5	3								
St. Johns, C. E. Knapp, M. D.	6							3			3		
Stockbridge, C. N. Brogan, M. D.	6				2	4							
Vermontville, C. S. Snell, M. D.	9							3	3	3			
Vermontville, F. H. Snell, M. D.	12	4	3	5									
Vernon, T. B. Scott, M. D.	9							3		4	2		
Bay and Eastern Division	732	43	47	66	56	60	83	60	78	62	59	62	56
Algonac, W. E. Bostwick, M. D.	5												
Almont, D. H. Burley, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Arcada Tp. (Lapeer Co.), G. D. Soper, M. D.	8									4	4		
Brown City, J. W. Weed, M. D.	24					3	4	4	3		2	5	3
Chesaning, D. W. Mudge, M. D.	37				2	4	5	4	5	4	4	5	4

EXHIBIT II.—CONTINUED.

Divisions and localities represented and physicians who reported. (Those not health officers in italics.)	Weekly reports in 1898.—Compiled in this article.												
	Year, 1898.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division.—Continued.													
Clifford, J. R. MacLeod, M. D.	17				2	2	3	3	3	2			2
Columbiaville, E. Conley, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Croswell, T. S. Kingston, M. D.	51	3	4	4	4	4	5	3	4	4	4	5	4
Deekerville, H. F. Alderton, M. D.	47	4	4	5	4	3	5	3	4	4	3	5	4
Emmett, W. C. Martin, M. D.	4												4
Essexville, H. J. Garber, M. D.	5			3	2								
Forestville, A. Stephens, M. D.	39	4	4	5	4	4	5	4	5	4			
Fremont Tp. (Tuscola Co.), B. D'Arcy, M. D.	44	4	4	5	4	4	4	2	5	4	4		4
Lapeer, J. V. Frazier, M. D.	50	4	4	5	4	4	5	4	5	4	3	4	4
Lexington, L. T. Schurrer, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Marine City, F. Blagborne, M. D.	9			5	2	4				4	4		
Marine City, F. W. Lang, M. D.	8					3	3				3		
Pinconning, W. B. Abbott, M. D.	17		3	3					3	2	2	4	
Port Sanilac, J. I. Manners, M. D.	16				2		4	2	3	3	2		
Reese, J. MacKinzle, M. D.	33					3	5	4	5	4	4	4	4
Sebewaing, N. J. Pike, M. D.	9				2	2		2	3				
Thornville, J. S. Caulkins, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Vassar, F. D. LeValley, M. D.	50	4	4	5	4	4	5	4	4	4	4	5	3
West Bay City, F. L. Tupper, M. D.	51	4	4	5	4	4	5	4	5	3	4	5	4
Southwestern Division.													
Allegan, W. J. Albright, M. D.	537	31	33	39	29	49	60	57	57	44	48	46	44
Allegan, D. Calkins, M. D.	8	4	4										
Benton Harbor, G. M. Bell, M. D.	29						5	2	5	4	4	5	4
Berrien Springs, A. J. McLaughlin, M. D.	16						4	2			3	3	4
Berrien Tp., J. H. Herring, M. D.	15								5				2
Buchanan, H. M. Broderick, M. D.	33				3	4	5	4	5	4	4		
Buchanan, J. I. Garland, M. D.	12	3	4	5									
Buchanan, H. M. Marvin, M. D.	26					3	5	3		3	4	5	3
Coloma, H. M. Marvin, M. D.	5		3										
Douglas, H. A. Stroud, M. D.	48	4	3	4	2	4	5	4	5	4	4	5	4
Dowagiac, M. P. White, M. D.	3												
Fennville, W. H. Andrews, M. D.	30	3	4	5	4	4					3	4	3
Gallen, W. H. Beach, M. D.	3		3										
Gobleville, J. J. Carpenter, M. D.	28					3	5	4	5	3	4		4
Lawrence, F. B. Crowell, M. D.	15	3	3	3	4			2					
Otsego, M. Chase, M. D.	13	4	4	5									
Otsego, H. E. Whitney, M. D.	20					3	4	4	4	3			2
Paw Paw, J. E. Maxwell, M. D.	23				2	4	5	4	5	3			
Plainwell, C. M. Stuck, M. D.	2							2					
Saugatuck, H. H. Stimson, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
South Haven, M. Springer, M. D.	6					2		2					2
Three Oaks, H. B. Wilcox, M. D.	39			4	4	4	4	3	5	4	4	3	4
Vandalia, C. H. Fox, M. D.	28	2				4	3	3	3	4	2	3	4
Watervliet, W. T. Bertrand, M. D.	31				2	4	5	3	5	4	4	4	
Watervliet, W. L. Garrett, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
South Central Division.													
Albion, A. G. Bruce, M. D.	818	67	72	73	59	74	90	74	82	64	52	68	43
Albion, A. M. Haight, M. D.	12	4	4	4									
Ann Arbor, E. A. Clark, M. D.	10				2	3	3				2		
Ann Arbor, J. Kapp, M. D.	34				3	5	4	5	4	4	5	4	
Athens, P. S. Fox, M. D.	9		3	4	2								
Augusta, C. E. Doyle, M. D.	7							3		2	2		
Blissfield, R. M. Eccles, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Bronson, S. M. Cornell, M. D.	5		2	3									
Brooklyn, F. W. Palmer, M. D.	2	2											
Burr Oak, R. Crofford, M. D.	6	3	3										
Burr Oak Tp., J. C. Rollman, M. D.	35					4	5	4	5	4	4	5	4
Centreville, D. C. Gee, M. D.	13	4	4	5									
Clinton, J. E. White, M. D.	12					3	5	4					
Concord, L. N. Keeler, M. D.	38	3	4	5	4	3	3	3		3	3	5	2
Concord, F. S. Tuthill, M. D.	27				2	4	5	3	4	4		5	
Constantine, D. E. Thomas, M. D.	12	4	3	5									
Deerfield, W. Bliss, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Dexter, N. A. Gates, M. D.	32	4	4	5		2	4	4	4	4	4	3	3
Galesburg, W. A. Burdick, M. D.	18				2	4	5	4	3				
Grass Lake, H. J. Hall, M. D.	31	2	3		2	3	5	3	4	3	2	4	
Hanover, A. L. Ambrose, M. D.	6							3	3				
Hudson Tp. (Lenawee Co.), E. J. C. Ellis, M. D.	25		2	5	4	3		2	5	4			
	29	3	4	5	4	3	3	2	5				

EXHIBIT II.—CONCLUDED.

Divisions and localities represented and physicians who reported. (Those not health officers in italics.)	Weekly reports in 1898.—Compiled in this article.												
	Year, 1898.	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
South Central Division.—Continued.													
Jackson, J. T. Main, M. D.	43	2	3	3	4	2	5	3	5	3	4	5	4
Kalamazoo, S. D. O'Brien, M. D.	9						5	4					
Kalamazoo, A. H. Rockwell, M. D.	5		3		2								
Manchester, C. F. Kapp, M. D.	29	4	3	5	4	4	5	4					
Marshall, F. M. Foote, M. D.	46	3	4	4	4	2	5	4	5	4	2	5	4
Mendon, G. W. Nihart, M. D.	12								5	4		3	
Mendon, W. A. Royer, M. D.	11	4	3	4									
Parma, C. D. Hubbard, M. D.	8				3	3				2			
Quincy, E. Blackman, M. D.	4	2				2							
Reading, F. R. Robson, M. D.	10					2					4	4	
Sturgis, W. M. Hoskinson, M. D.	35					4	5	4	5	4	4	5	4
Tecumseh, <i>J. F. Jenkins, M. D.</i>	47	4	4	3	3	4	4	4	5	4	3	5	4
Tekonsha, F. A. Warren, M. D.	16								5	3	2	4	2
Three Rivers, W. E. Clark, M. D.	3	3											
Vicksburg, F. S. Collar, M. D.	13	4	4	5									
White Pigeon, W. C. Cameron, M. D.	39	4	4		3	3	5	4	4	4			4
Ypsilanti, E. Batwell, M. D.	15	4	4	3	4								
Ypsilanti, O. E. Pratt, M. D.	6					3	3						
Southeastern Division.													
Highland Park, A. Stewart, M. D.	369	27	28	33	25	31	35	34	30	29	34	35	28
Holly, D. D. Bartholomew, M. D.	51	4	4	5	4		5	4	4	4	4	5	4
Memphis, D. H. Cole, M. D.	14							2	4	4	4		
Memphis, E. D. Mills, M. D.	35				2	4	5	4	5	4	4	4	3
Mt. Clemens, E. G. Folsom, M. D.	11	4	4	3									
New Haven, A. Gunn, M. D.	36	4	4	5	4	4	5	4	4				2
Petersburg, R. R. Kirby, M. D.	35				2	4	5	3	4	4	4	5	4
Plymouth, F. B. Adams, M. D.	10		2	3			3				2		
Plymouth, F. N. Dewey, M. D.	29				3	4	3	4		4	4	5	2
Richmond, F. T. Fenton, M. D.	12	4	4	4					4	4			
Romeo, W. Greenshields, M. D.	50	4	4	5	4	4	5	4	4	3	4	5	4
Trenton, A. O. Osborn, M. D.	47	4	4	5	4	4	4	4	5	4	2	4	3
Wayne, H. E. Foster, M. D.	7										2	3	2
Wyandotte, N. T. Langlois, M. D.	24	3	2	3	2			2			4	4	4

DIAGRAM I—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1898.



TABLE 1.—*Stating for each of 13 years, 1886–1898, the number and per cent of observers by whom the following diseases were reported present; also an average for the period of 21 years, 1877–1897, and an average for the period of 12 years, 1886–1897. The diseases are arranged in order of greatest number of observers who reported them present in 1898.* (Continued for each month of 1897 and 1898 on the two pages following.)*

Line number.	Diseases.	Observers by whom the several diseases were reported present— average per cents (per month) of those making reports.†														
		Av. 1877- 97.†	Av. 1886- 97.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
	Av. for tabulated dis- eases reported pres. ‡	36	33	26	27	21	30	30	31	33	37	37	36	35	37	37
1	Rheumatism.....	82	82	76	81	78	78	78	80	83	86	87	82	82	82	85
2	Neuralgia.....	80	79	70	74	74	74	74	76	80	83	85	82	79	83	83
3	Bronchitis.....	73	72	65	66	70	69	67	72	73	75	81	75	74	69	71
4	Tonsillitis.....	69	69	60	64	70	66	64	71	71	74	75	71	64	68	70
5	Influenza.....	55	56	59	61	59	58	55	57	56	69	67	49	46	46	48
6	Diarrhea.....	63	62	55	53	55	60	58	61	63	67	68	65	60	65	64
7	Pneumonia.....	48	42	33	36	34	36	36	37	43	40	50	47	49	46	48
8	Intermittent fever..	64	48	32	27	31	35	36	37	43	52	58	61	59	64	71
9	Pleuritis.....	32	-----	29	30	32	32	28	27	35	36	35	33	32	-----	-----
10	Inflam. of kidney....	34	33	29	30	29	33	31	29	36	36	36	35	33	32	35
11	Erysipelas.....	38	36	25	27	26	28	27	29	34	39	43	43	44	44	43
12	Consumption, pul....	59	49	25	25	29	35	43	47	49	60	62	59	57	60	64
13	Inflam. of bowels...	28	28	24	24	23	25	27	25	28	31	29	29	30	32	32
14	Cholera morbus.....	30	28	23	21	23	26	27	26	29	31	29	27	29	33	29
15	Dysentery.....	30	29	23	24	23	28	27	25	29	30	31	33	30	33	30
16	Remittent fever.....	48	37	22	20	27	32	31	28	34	43	40	45	49	46	48
17	Cholera infantum....	21	20	16	14	15	22	20	18	21	23	21	21	20	24	25
18	Typhoid fever (ent.)	18	16	14	11	16	21	18	15	15	16	14	17	16	15	15
19	Measles.....	18	15	12	22	12	8	11	14	7	17	22	12	25	22	10
20	Scarlet fever.....	23	18	9	8	14	19	24	19	22	17	18	18	17	15	20
21	Whooping-cough....	22	18	8	7	12	14	18	15	18	16	17	25	16	24	28
22	Diphtheria.....	24	14	6	10	10	10	13	13	15	13	16	12	14	18	24
23	Cerebro-spi. men....	7	6	6	3	4	2	4	5	5	6	8	7	7	7	8
24	Inflam. of brain.....	11	10	5	6	7	8	9	8	9	11	12	13	13	15	13
25	Typho-mal. fever...	23	14	5	2	6	8	8	9	10	12	14	26	25	26	27
26	Puerperal fever.....	10	10	5	7	6	7	6	9	11	8	9	13	12	14	12
27	Membranous croup..	10	7	2	3	2	4	5	5	8	10	11	7	10	10	12
28	Smallpox.....	1	0.4	0.1	.09	1	0.5	1	0.3	.08	0	0.2	0.5	.07	.01	0.5
	No. of observers....	\$150	\$166	217	167	144	185	189	205	199	145	155	139	142	155	169
	Av. No. of observers / per month.....	92	102	114	95	82	94	116	113	109	91	102	100	102	114	113

*For 1898 the names of the observers and the number of the reports received from each are stated in Exhibit II.

†Foot-notes are on page 77.

‡Averages per year.

TABLE 1.—CONTINUED.—*Per cent of observers by whom the several diseases were reported the period of 21 years, 1877-97, and*

Per cent of observers by whom the diseases were reported present.†																			
Line number.	January.					February.					March.								
	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.				
	Average	38	34	26	26	Average	36	33	26	26	Average	37	34	29	28				
1	Rheumatism	86	84	82	82	Rheumatism	84	82	83	79	Rheumatism	85	84	87	81				
2	Influenza	74	76	80	76	Neuralgia	83	82	80	75	Influenza	77	82	84	88				
3	Neuralgia	82	82	77	75	Influenza	76	80	80	86	Neuralgia	86	85	82	80				
4	Bronchitis	83	80	73	74	Bronchitis	84	82	72	78	Bronchitis	84	82	71	76				
5	Tonsillitis	80	80	67	77	Tonsillitis	77	76	68	74	Tonsillitis	78	78	71	76				
6	Pneumonia	72	65	48	55	Pneumonia	73	66	53	56	Pneumonia	71	65	59	61				
7	Pleuritis	43	42	38	38	Diarrhea	44	44	44	34	Pleuritis	43	43	42	43				
8	Diarrhea	46	46	41	31	Pleuritis	41	39	35	25	Diarrhea	47	47	39	42				
9	Inflam. of kidney	34	33	34	26	Inflam. of kidney	36	35	30	23	Erysipelas	43	40	34	25				
10	Erysipelas	42	38	26	25	Erysipelas	41	38	27	30	Inflam. of kidney	37	36	31	26				
11	Inflam. of bowels	25	25	22	15	Consumption, pul.	61	50	22	25	Intermittent fev.	57	42	29	21				
12	Intermittent fev.	55	40	20	20	Inflam. of bowels	24	23	19	20	Inflam. of bowels	27	26	25	20				
13	Remittent fever	42	32	17	18	Intermittent fev.	54	39	18	22	Consumption, pul.	62	52	23	29				
14	Measles	16	13	17	14	Remittent fever	44	30	13	16	Measles	24	23	18	31				
15	Consumption, pul.	61	52	16	27	Scarlet fever	27	12	12	9	Dysentery	14	13	16	14				
16	Diphtheria	30	18	12	16	Cerebro-spl. men.	19	15	11	17	Remittent fever	41	30	16	14				
17	Dysentery	15	14	12	11	Diphtheria	26	15	11	14	Typhoid fev. (ent.)	9	7	13	8				
18	Typhoid fev. (ent.)	15	11	12	5	Measles	19	17	11	17	Whooping-cough	21	17	10	6				
19	Scarlet fever	30	23	11	10	Dysentery	12	12	10	11	Diphtheria	24	13	10	11				
20	Cerebro-spl. men.	6	5	4	3	Typhoid fev. (ent.)	12	9	9	8	Cholera morbus	11	9	8	8				
21	Cholera morbus	6	5	4	3	Inflam. of brain	12	11	8	4	Puerperal fever	12	11	8	9				
22	Membran. croup	18	12	4	6	Cholera morbus	12	9	7	6	Scarlet fever	29	20	6	5				
23	Typho-mal. fever	19	11	4	0	Whooping-cough	21	16	6	3	Inflam. of brain	13	12	6	7				
24	Puerperal fever	12	11	4	0	Membran. croup	14	10	3	2	Cerebro-spl. men.	9	7	3	4				
25	Whooping-cough	22	17	4	6	Puerperal fever	11	10	3	7	Cholera infantum	4	3	3	1				
26	Inflam. of brain	11	10	4	0	Cholera infantum	4	4	3	2	Membran. croup	13	9	3	3				
27	Cholera infantum	4	4	1	0	Typho-mal. fever	16	9	2	1	Typho-mal. fever	15	9	3	3				
28	Smallpox	2	0.5	0	0	Smallpox	1	0.7	0	0	Smallpox	1	0.9	1	0				
	Observers§	89	98	92	102	Observers§	90	99	103	107	Observers§	88	96	100	97				
Line number.	April.					May.					June.								
	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.	Diseases.	Av. '77-97.	Av. '86-97.	1898.	1897.				
	Average	37	34	26	26	Average	36	33	24	25	Average	35	32	24	28				
1	Rheumatism	87	86	76	85	Rheumatism	85	84	76	78	Rheumatism	83	82	76	81				
2	Neuralgia	84	83	76	77	Bronchitis	76	74	67	59	Neuralgia	78	76	65	76				
3	Influenza	69	73	72	84	Influenza	56	58	64	57	Bronchitis	68	67	56	67				
4	Bronchitis	82	81	68	72	Neuralgia	80	79	64	75	Tonsillitis	63	61	56	57				
5	Tonsillitis	75	75	64	61	Tonsillitis	70	70	57	62	Diarrhea	63	62	52	53				
6	Pneumonia	66	59	47	46	Pneumonia	55	48	39	38	Influenza	40	40	50	46				
7	Pleuritis	40	38	40	40	Diarrhea	53	51	37	40	Intermittent fev.	67	51	30	35				
8	Diarrhea	49	48	34	35	Consumption, pul.	63	53	30	26	Inflam. of kidney	35	35	29	38				
9	Inflam. of kidney	37	37	28	23	Intermittent fev.	67	50	30	21	Consumption, pul.	59	50	28	32				
10	Measles	30	26	33	38	Pleuritis	33	30	30	30	Pleuritis	28	27	25	25				
11	Consumption, pul.	63	54	25	23	Erysipelas	44	40	27	28	Erysipelas	39	37	26	28				
12	Erysipelas	43	40	25	31	Inflam. of bowels	27	28	23	20	Measles	29	25	24	41				
13	Intermittent fev.	63	47	24	24	Inflam. of kidney	38	37	22	22	Inflam. of bowels	29	29	23	33				
14	Inflam. of bowels	24	24	18	16	Remittent fever	46	34	19	15	Pneumonia	36	30	22	28				
15	Remittent fever	44	32	15	17	Measles	34	30	18	41	Remittent fever	48	36	21	25				
16	Puerperal fever	11	11	11	5	Cholera morbus	18	16	11	7	Cholera morbus	34	30	18	14				
17	Typhoid fev. (ent.)	8	5	10	1	Whooping-cough	23	19	11	9	Cholera infantum	21	19	17	15				
18	Scarlet fever	27	20	9	9	Scarlet fever	25	19	8	7	Dysentery	23	21	15	18				
19	Whooping-cough	22	18	8	5	Puerperal fever	11	10	7	8	Cerebro-spl. men.	7	5	9	6				
20	Dysentery	14	13	8	12	Dysentery	17	17	7	13	Inflam. of brain	12	11	6	11				
21	Inflam. of brain	13	11	7	3	Cerebro-spl. men.	8	7	6	5	Diphtheria	19	11	6	6				
22	Diphtheria	22	11	6	10	Inflam. of brain	12	11	5	6	Typhoid fev. (ent.)	10	9	6	8				
23	Cerebro-spl. men.	9	6	5	6	Typhoid fev. (ent.)	8	7	5	7	Puerperal fever	11	10	6	7				
24	Cholera infantum	4	4	5	1	Typho-mal. fever	15	10	3	3	Scarlet fever	22	16	6	12				
25	Cholera morbus	12	10	5	11	Cholera infantum	9	9	2	5	Whooping-cough	23	19	6	7				
26	Membran. croup	11	9	4	1	Membran. croup	9	7	2	3	Typho-mal. fever	15	9	2	3				
27	Typho-mal. fever	15	10	2	1	Diphtheria	20	13	2	10	Membran. croup	6	4	0.8	2				
28	Smallpox	2	0.6	1	1	Smallpox	2	0.3	0	0	Smallpox	1	0.5	0	0				
	Observers§	82	89	104	93	Observers§	89	99	132	103	Observers§	93	104	124	97				

* , † , ‡ . These notes are on the preceding page. § The numbers in this line state how many

ported present by months in each of the years 1897-98,* and the average by months for the period of 12 years, 1886-97.

Per cent of observers by whom the diseases were reported present.†																
July.					August.					September.					Line number.	
Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.	Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.	Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.		
Average	38	34	24	26	Average	39	36	30	28	Average	40	36	28	32		
Rheumatism	79	79	69	79	Diarrhea	93	90	84	77	Diarrhea	91	88	82	87	1	
Diarrhea	86	82	66	64	Rheumatism	75	76	77	75	Rheumatism	77	79	71	87	2	
Neuralgia	77	76	53	69	Neuralgia	74	75	65	72	Neuralgia	75	75	64	75	3	
Bronchitis	59	58	52	54	Cholera morbus	72	68	63	48	Bronchitis	63	64	59	66	4	
Tonsillitis	57	58	46	48	Bronchitis	57	58	57	57	Cholera morbus	61	58	56	55	5	
Cholera morbus	64	58	42	41	Dysentery	69	64	54	43	Dysentery	66	62	50	58	6	
Influenza	31	30	34	34	Tonsillitis	56	57	52	58	Tonsillitis	58	58	48	54	7	
Dysentery	46	42	32	29	Cholera infantum	62	59	49	39	Intermittent fever	71	55	45	41	8	
Cholera infantum	46	44	31	29	Intermittent fever	71	55	45	34	Cholera infantum	55	53	44	45	9	
Consumption, pul.	58	48	31	28	Inflam. of bowels	37	37	38	37	Influenza	41	39	39	52	10	
Intermittent fever	70	55	30	25	Influenza	32	30	34	37	Remittent fever	58	45	32	32	11	
Inflam. of kidney	33	33	26	35	Remittent fever	56	44	33	25	Inflam. of bowels	32	32	26	35	12	
Remittent fever	53	41	25	25	Inflam. of kidney	25	29	32	28	Inflam. of kidney	27	27	24	28	13	
Inflam. of bowels	33	33	23	33	Consumption, pul.	56	48	29	26	Typhoid fever (ent.)	30	30	21	21	14	
Pleuritis	24	22	20	20	Erysipelas	32	30	21	24	Consumption, pul.	56	46	21	24	15	
Erysipelas	36	33	20	23	Typhoid fever (ent.)	23	23	20	18	Pneumonia	26	22	20	19	16	
Measles	20	17	15	24	Pleuritis	19	20	19	19	Pleuritis	24	24	19	32	17	
Typhoid fever (ent.)	14	14	11	6	Measles	10	8	10	12	Erysipelas	30	30	18	25	18	
Pneumonia	26	29	11	7	Pneumonia	22	18	10	12	Typho-mal. fever	40	26	12	7	19	
Scarlet fever	18	13	10	7	Scarlet fever	16	12	10	6	Scarlet fever	17	13	7	7	20	
Inflam. of brain	12	11	7	6	Whooping-cough	25	21	10	10	Whooping-cough	23	19	6	7	21	
Cerebro-spi. men.	7	6	6	1	Puerperal fever	9	8	9	10	Cerebro-spi. men.	8	6	6	6	22	
Whooping-cough	26	22	6	16	Cerebro-spi. men.	7	6	9	1	Measles	7	5	4	7	23	
Puerperal fever	9	8	4	4	Typho-mal. fever	30	21	6	5	Inflam. of brain	11	9	4	7	24	
Typho-mal. fever	19	13	4	4	Inflam. of brain	13	11	4	5	Diphtheria	21	13	3	5	25	
Diphtheria	18	10	2	10	Diphtheria	19	11	0	9	Puerperal fever	9	8	3	6	26	
Membran. croup	4	3	0	7	Membran. croup	4	3	0	0	Membran. croup	6	4	0	2	27	
Smallpox	1	0	3	0	Smallpox	0	7	0	0	Smallpox	0	5	0	0	28	
Observers§	96	107	134	99	Observers§	99	110	115	93	Observers§	98	109	126	85		
October.					November.					December.					Line number.	
Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.	Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.	Diseases.	Av. 77-97.†	Av. 86-97.	1898.	1897.		
Average	39	35	28	28	Average	36	32	28	25	Average	36	32	25	26		
Neuralgia	79	78	74	67	Bronchitis	76	74	76	65	Influenza	67	71	76	67	1	
Rheumatism	83	82	74	78	Rheumatism	83	82	75	79	Bronchitis	80	78	74	71	2	
Diarrhea	77	75	68	74	Neuralgia	80	79	74	74	Rheumatism	84	83	73	80	3	
Bronchitis	75	70	68	56	Tonsillitis	75	74	70	69	Neuralgia	81	79	73	72	4	
Tonsillitis	69	69	64	59	Influenza	57	58	66	53	Tonsillitis	79	78	65	71	5	
Influenza	47	47	47	49	Diarrhea	54	52	55	53	Diarrhea	46	46	42	48	6	
Intermittent fever	68	52	43	39	Intermittent fever	62	46	41	28	Pneumonia	59	52	37	43	7	
Dysentery	44	42	40	52	Pneumonia	48	42	40	38	Inflam. of kidney	34	33	32	39	8	
Cholera morbus	31	30	34	40	Pleuritis	31	32	25	19	Erysipelas	39	37	28	31	9	
Inflam. of kidney	33	32	32	32	Erysipelas	37	34	31	25	Pleuritis	37	37	28	33	10	
Remittent fever	57	45	28	28	Inflam. of kidney	32	32	30	34	Inflam. of bowels	26	26	24	25	11	
Cholera infantum	25	25	26	29	Consumption, pul.	57	46	28	18	Consumption, pul.	58	47	22	19	12	
Typhoid fever (ent.)	33	31	25	22	Remittent fever	50	39	25	19	Intermittent fever	56	41	23	22	13	
Pleuritis	28	24	24	28	Typhoid fever (ent.)	27	24	25	19	Remittent fever	45	34	19	13	14	
Erysipelas	35	32	24	22	Inflam. of bowels	24	23	20	13	Scarlet fever	27	22	12	14	15	
Inflam. of bowels	29	28	23	28	Cholera morbus	14	14	14	15	Typhoid fever (ent.)	19	16	11	13	16	
Consumption, pul.	58	45	23	19	Dysentery	22	21	13	24	Diphtheria	30	17	10	12	17	
Pneumonia	35	31	22	27	Scarlet fever	22	18	13	8	Dysentery	14	14	8	16	18	
Scarlet fever	21	17	10	10	Whooping-cough	20	15	12	6	Whooping-cough	20	14	8	6	19	
Diphtheria	29	17	8	10	Diphtheria	30	18	9	11	Typho-mal. fever	22	12	6	2	20	
Typho-mal. fever	41	26	8	0	Typho-mal. fever	30	17	8	0	Inflam. of brain	11	11	4	7	21	
Whooping-cough	20	14	5	6	Inflam. of brain	10	9	8	4	Cerebro-spi. men.	6	5	4	1	22	
Puerperal fever	10	9	4	5	Puerperal fever	10	9	5	7	Cholera morbus	11	10	4	6	23	
Cerebro-spi. men.	7	4	3	1	Cholera infantum	9	8	3	8	Measles	12	9	4	17	24	
Membran. croup	11	8	2	1	Cerebro-spi. men.	5	4	2	1	Cholera infantum	5	4	0	1	25	
Measles	6	5	2	5	Membran. croup	14	10	2	3	Puerperal fever	10	9	0	9	26	
Inflam. of brain	10	9	0	9	Measles	9	8	0	11	Membran. croup	16	11	0	5	27	
Smallpox	0	5	0	0	Smallpox	0	9	0	0	Smallpox	1	0	3	0	28	
Observers§	97	106	121	94	Observers§	95	106	106	89	Observers§	93	102	113	83		

observers reported for the month in the given year.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1898.—Exhibiting for the year and for each month of the year ending December 31, 1898, a summary relative to diseases in the State of Michigan; also for each month a summary relative to diseases in each of 11 geographical divisions* of the State.—Indicating the prevalence as regards time and area. Compiled from 5,219 weekly reports by 217 observers, health officers of cities and villages, regular correspondents of the State Board of Health, and other physicians, reporting the diseases under their observation.

Number of observers, reports, etc.†	Diseases.	(Av. b) per cent of observers report- ing prevalence of.	Average per cent of weeks reported present where pres- ent.	Per cent of reports stating pre- valence of.	Average order of prevalence where present.	Average order of prevalence where present.											Av. 1877- 1897.‡	Av. 1877- 1897.‡
						1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.* 1887.	1886.		
	Av'age for tabulated dis- eases reported present.	26	63	17	2.6	2.7	2.7	3.0	3.0	3.3	3.1	3.3	3.3	3.3	3.5	3.7	3.7	3.2
	Brain, inflammation of.....	5	36	2	3.6	3.4	4.1	4.0	4.8	4.3	3.9	4.9	5.4	4.8	6.4	5.9	5.6	4.8
	Bowels, inflammation of.....	24	42	10	3.3	3.3	3.5	3.6	3.8	4.0	4.1	4.3	4.4	4.1	4.6	5.0	4.8	4.1
	Bronchitis.....	65	74	49	2.5	2.6	2.4	2.6	2.6	2.5	2.6	2.7	2.6	2.7	2.7	3.0	2.9	2.7
	Cerebro-spinal meningitis.....	6	38	2	3.2	3.4	3.6	3.7	3.9	4.4	3.7	5.3	4.7	4.2	4.6	7.8	7.3	4.7
	Cholera infantum.....	16	51	8	2.8	2.9	2.9	3.0	3.3	3.4	3.6	3.6	3.5	3.4	4.0	4.1	3.9	3.5
	Cholera morbus.....	23	48	12	2.7	3.0	2.9	3.0	3.3	3.3	3.4	3.4	3.5	3.4	3.7	3.8	4.2	3.4
	Consumption, pulmonary.....	25	79	20	2.9	3.1	3.0	3.5	3.4	3.5	3.7	3.8	3.5	3.5	3.6	3.7	3.9	3.5
	Group, membranous.....	2	33	0.5	3.6	2.9	3.9	4.6	4.5	4.1	4.7	4.4	4.6	4.3	5.1	6.8	6.2	4.7
	Diphtheria.....	6	46	3	3.1	2.9	3.7	4.4	3.5	3.4	3.5	4.4	4.2	4.3	4.8	4.4	4.2	3.9
	Diarrhea.....	55	64	36	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.9	2.8	3.0	3.0	3.2	2.7
	Dysentery.....	23	51	12	3.0	3.2	3.0	3.2	3.3	3.6	3.8	3.8	3.8	3.7	3.8	4.3	4.5	3.7
	Erysipelas.....	25	47	12	3.3	3.4	3.5	3.7	3.8	3.9	4.1	4.2	4.1	4.1	4.4	4.7	4.6	4.0
	Fever, intermittent.....	32	57	19	2.6	2.7	2.7	2.9	2.9	2.9	3.0	3.2	2.9	2.6	2.6	2.8	2.6	2.8
	Fever, remittent.....	22	57	13	2.9	3.2	2.9	3.1	3.1	2.9	2.9	3.3	3.2	3.2	3.1	3.4	3.3	3.1
	Fever, typhoid (enteric).....	14	54	8	2.9	3.3	3.3	3.4	3.6	3.2	3.6	3.5	3.8	3.9	4.2	4.5	4.7	3.8
	Fever, typho-malarial.....	5	48	2	3.1	2.7	2.8	3.2	3.7	3.6	3.7	3.6	3.6	3.9	3.6	4.1	4.2	3.6

ending December 31, 1898.

localities represented, 194.
observers during the year, 217.
reports per month, 435.
reports compiled, 5,219. a
observers per month, 114.
localities represented, 109.

For the year	Whole number of Average number of Whole number of Average number of Total number of Average number of	59	75	45	1.7	1.8	2.0	2.2	2.0	2.1	2.0	2.2	2.4	2.7	3.0	2.7	2.6	2.2
Influenza.....	29	57	17	3.2	3.4	3.5	3.6	3.7	3.7	3.6	3.9	4.1	4.1	4.5	4.9	4.7	4.1	4.0
Kidney, inflammation of..	12	56	7	2.7	2.3	2.7	3.1	2.8	2.8	3.3	3.0	3.0	3.5	3.2	3.6	5.0	3.9	3.2
Measles.....	70	76	54	2.3	2.4	2.3	2.5	2.5	2.5	2.5	2.8	2.7	2.6	2.7	2.8	2.8	3.0	2.6
Neuralgia.....	29	51	15	3.3	3.6	3.4	3.8	3.8	3.8	4.0	4.1	4.2	4.0	4.4	-----	-----	3.9	3.9
Pleuritis.....	33	51	17	3.2	3.4	3.2	3.7	3.7	3.7	3.7	4.0	3.9	3.7	4.0	4.3	4.0	4.2	3.8
Pneumonia.....	5	37	2	3.1	3.1	3.2	3.5	3.9	3.8	4.1	4.5	4.5	3.4	4.6	5.7	5.9	5.4	4.2
Puerperal fever.....	76	81	62	2.2	2.3	2.3	2.7	2.6	2.6	2.7	2.9	2.9	2.8	3.0	3.2	3.2	3.3	2.8
Rheumatism.....	9	52	5	2.7	3.0	3.1	3.5	3.3	3.6	3.2	4.2	4.2	3.9	4.6	5.0	4.5	4.5	3.8
Scarlet fever.....	0.1	22	.04	2.0	2.0	6.3	2.8	4.1	4.8	5.0	0	6.5	11.0	15.3	26.0	25.9	9.7	9.1
Smallpox.....	60	66	40	2.7	2.6	2.6	3.0	3.0	2.8	2.9	3.3	3.4	3.3	3.4	3.4	3.4	3.4	3.1
Tonsillitis.....	8	63	5	2.4	2.1	2.4	2.6	2.9	3.0	3.0	2.9	3.2	3.3	3.9	4.2	3.7	3.9	3.1
Whooping-cough.....																		

* The counties in each division are shown in Exhibit I. In preceding reports.

+ The names of observers, and number of reports received from each, are shown in Exhibit II.

† This note on page

a. Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

b. The numbers in this column (pages 74-77) state, not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average month. But on pages 76 and 77 the numbers in the "per cent of observers" column are statements for the month, and not averages. This column indicates the area of prevalence except that in a few instances there were two or more observers in one city or village.

c. This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the diseases present. It is therefore an average, not for all localities represented, but only for those at which the given disease was reported present. In the line "average for tabulated diseases" it states what per cent the number of times all diseases were reported present is of the number of times they might have been so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

d. This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from all observers in the State or Division, as the case may be. It combines, and states, in a general way, an idea of the time a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

e. The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the order of prevalence column, in Table 3 (table giving statements for each locality, omitted in printing this report, for want of room), by the number of observers who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of observers who reported the different diseases present, thus counting each observer once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

Av. for tab. dis. rep. pres.	24	60	15	2.5	30	59	18	2.6	28	64	18	2.6	28	63	18	2.6	28	61	17	2.5	25	70	18	2.8
Brain, inflammation of	7	42	3	3.6	4	20	1	3.6	4	37	2	2.8	0.8	25	0.2	3.0	8	28	0.2	4.0	4	50	2	3.3
Bowels, inflammation of	23	52	13	3.3	38	41	15	3.3	26	52	14	2.9	23	43	10	2.9	20	31	6	3.5	74	85	64	3.7
Bronchitis	62	33	3	2.6	57	66	38	2.9	59	69	41	2.8	68	72	52	2.6	76	77	59	2.1	24	85	64	3.4
Cerebro-spinal meningitis	6	52	3	3.6	9	26	2	3.4	6	43	3	2.6	3	36	1	2.5	2	40	0.8	4.5	4	31	1	2.0
Cholera infantum	31	53	18	2.7	49	58	28	2.8	44	57	26	2.6	26	47	12	2.8	3	25	0.6	1.7	0.9	25	0.3	3.0
Cholera morbus	42	52	22	3.3	63	56	36	2.5	56	56	31	2.7	34	44	16	3.1	14	22	3	3.4	4	20	2	4.2
Consumption, pulmonary	31	74	24	2.7	29	71	20	2.6	21	87	19	2.7	23	85	19	2.3	28	71	22	2.6	22	82	20	3.2
Croup, membranous	0.7	25	0.2	3.0	0	0	0	0	0	0	0	0	2	33	0.5	8.0	2	29	0.4	1.5	0	0	0	0
Diphtheria	2	27	0.7	1.3	0.9	60	0.6	3.0	3	75	2	3.8	8	48	4	3.0	9	50	5	2.0	10	42	5	2.9
Diarrhea	66	71	48	1.8	84	79	65	1.6	82	82	67	1.5	68	72	49	2.8	55	49	28	2.8	42	59	25	3.3
Dysentery	32	49	16	2.9	54	60	33	2.8	50	63	32	2.6	40	51	21	2.7	13	40	5	3.2	48	38	3	3.4
Erysipelas	20	43	9	3.2	21	35	7	3.1	18	49	9	3.1	24	52	12	3.4	31	42	13	3.1	28	47	14	3.7
Fever, intermittent	30	63	20	2.4	45	58	26	2.5	45	55	26	2.5	43	58	25	2.4	41	53	22	2.8	22	51	12	2.7
Fever, remittent	25	56	15	2.8	33	54	18	2.6	32	62	21	2.6	28	60	18	2.6	25	54	13	3.0	19	64	13	3.2
Fever, typhoid (enteric)	11	48	6	2.9	20	46	10	2.8	21	56	14	2.6	25	62	15	2.8	25	53	13	2.9	11	68	7	4.1
Fever, typho-malarial	4	45	2	2.5	6	33	2	3.1	12	50	6	2.9	8	69	6	2.7	8	45	4	2.6	6	58	4	3.7
Influenza	34	58	20	2.1	34	59	20	2.3	39	66	27	2.1	47	65	31	2.1	66	72	48	1.7	76	80	63	1.5
Kidney, inflammation of	26	55	15	2.7	32	53	17	3.1	24	62	16	3.4	32	55	18	3.0	30	60	19	2.9	32	61	21	3.6
Measles	15	58	8	2.6	10	43	4	1.9	4	47	2	2.6	2	33	0.5	2.0	0	0	0	0	4	60	2	3.0
Neuralgia	53	71	39	2.0	65	70	46	2.5	64	69	46	2.5	74	71	54	2.3	74	79	59	2.1	73	83	60	2.5
Pleuritis	22	41	10	3.0	20	38	8	2.8	19	39	8	3.3	24	45	11	3.2	32	45	15	3.1	28	55	17	3.7
Pneumonia	11	40	5	3.3	10	29	3	3.1	20	40	8	3.6	22	48	11	3.4	40	41	16	3.1	37	59	22	3.9
Puerperal fever	4	44	2	2.2	9	28	3	3.9	3	31	1	2.5	4	26	1	3.4	5	26	1	3.0	0.9	25	0.3	6.0
Rheumatism	69	79	55	2.1	77	71	55	2.3	71	78	57	2.4	74	83	62	2.2	75	84	63	2.1	73	84	63	2.3
Scarlatina	10	51	5	1.8	10	46	4	2.8	7	45	3	3.0	10	48	5	3.7	13	57	8	2.6	12	60	8	2.4
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	46	59	28	2.5	52	55	29	2.8	48	65	23	2.8	64	62	40	2.7	70	68	47	2.4	63	75	50	2.9
Whooping-cough	6	72	5	1.1	10	60	6	2.5	6	63	4	2.3	5	45	2	1.7	12	61	7	2.8	8	82	7	3.1

[Foot-notes from pages 63-65 and 71-73.]

+ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsillitis were not printed on any blanks prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; pleuritis was not printed on any cards used prior to 1888; hence it is probable that the diseases were not so fully reported at first as were the other diseases.

+ The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The columns for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for that month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

TABLE 2.—CONTINUED.—Diseases in the Upper Peninsula, the Northwestern, the Northern, and the Northeastern Divisions of the State for the year and by months in 1898; also an average for the period of 21 years, 1877-1897, and an average for the period of 12 years, 1886-1897—indicating what per cent of the weekly reports received stated the presence of the diseases named.^a

Division.*	Diseases.	1877-97,†	1886-97.	1898,†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	26	23	22	15	15	29	22	25	23	22	24	25	29	25	23
	Brain, inflammation of...	6	6	3	0	0	0	0	16	8	0	0	0	0	8	0
	Bowels, inflammation of...	16	13	14	11	4	11	19	21	23	17	26	13	6	17	0
	Bronchitis.....	69	67	63	47	50	63	52	68	62	67	65	56	71	83	70
	Cerebro-spi. meningitis...	2	3	5	5	8	5	19	11	8	0	4	0	0	0	0
	Cholera infantum.....	14	15	13	0	0	3	5	0	0	58	43	25	24	0	6
	Cholera morbus.....	18	19	23	11	4	8	14	25	31	38	52	50	35	9	12
	Consumption, pulmonary.	57	43	36	0	8	16	38	53	42	58	25	44	53	57	59
	Croup, membranous.....	5	4	2	0	0	5	0	0	0	0	4	0	12	0	0
	Diphtheria.....	10	12	6	11	15	11	14	0	8	0	0	0	0	0	0
	Diarrhea.....	58	56	57	53	15	53	24	53	54	71	87	100	88	57	53
	Dysentery.....	22	19	18	16	8	16	5	11	19	25	30	44	29	13	12
	Erysipelas.....	19	15	17	0	15	13	10	32	35	25	9	6	12	22	24
	Fever, intermittent.....	6	4	3	0	0	0	0	0	0	0	0	0	18	17	0
	Fever, remittent.....	8	3	2	0	0	0	0	0	4	8	0	0	0	0	0
	Fever, typhoid (enteric).	32	27	19	21	4	3	24	11	0	4	22	50	59	48	24
	Fever, typho-malarial.....	3	2	0	0	0	0	0	0	0	0	4	6	0	0	0
	Influenza.....	41	35	60	27	62	71	86	79	58	46	35	50	71	65	53
	Kidney, inflammation of..	28	23	25	11	0	18	19	16	31	25	35	50	35	43	41
	Measles.....	14	10	6	0	0	0	5	5	27	8	13	0	0	18	0
	Neuralgia.....	56	56	57	47	46	68	57	74	58	33	57	56	65	61	53
	Pleuritis.....	19	19	6	0	8	3	24	5	8	4	0	0	0	9	12
	Pneumonia.....	33	28	33	32	38	34	43	47	35	8	0	19	59	39	53
	Pyrexial fever.....	5	6	3	5	0	3	0	0	0	13	4	0	6	0	0
	Rheumatism.....	59	54	56	42	42	61	62	89	73	38	43	50	59	61	53
	Scarlatina.....	23	17	2	0	1	0	19	0	0	0	0	0	0	0	0
	Smallpox.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis.....	52	55	68	63	73	71	67	79	62	54	70	63	82	65	65
	Whooping-cough.....	20	18	15	16	8	16	14	0	0	0	30	25	12	30	35

Upper Peninsula Division.*

Northwestern Division.*

Northern Division.*

Northeastern Division.*

A. v. for tab. dis. rep. pres.	19	19	17	20	18	17	22	20	15	15	17	18	16	13	19	Northern Division.*										25	23	20	22	17	20	35	21	17	17	20	20	18	21	27
Brain, inflammation of.....	9	11	1	0	4	4	0	0	3	17	4	0	0	0	0	Northeastern Division.*	3	3	0	0	0	0	0	0	0	0	0	0	0	10	0	7	0							
Bowels, inflammation of.....	10	12	5	0	4	0	0	0	3	15	4	10	7	0	7		21	20	23	0	13	33	50	13	18	33	40	28	20	7	30	7	30							
Bronchitis, inflammation of.....	52	53	56	58	60	46	83	80	45	42	44	63	66	59	82		69	66	66	75	56	56	100	50	45	44	50	51	67	93	90									
Cerebro-spi. meningitis.....	4	4	2	0	4	0	0	0	3	0	0	0	0	0	7		1	0.9	0.8	0	0	0	0	0	0	0	0	0	7	0	0	0								
Cholera infantum.....	7	8	4	0	0	0	0	0	3	8	22	3	7	0	0		7	6	6	3	0	0	0	0	0	0	0	0	15	13	0	0								
Cholera morbus.....	8	9	3	0	0	0	0	0	3	8	30	23	13	3	0		8	6	6	0	0	0	0	0	0	0	0	20	23	13	0	0								
Consumption, pulmonary.....	29	34	7	0	4	11	0	7	10	21	7	0	10	10	0		37	29	6	13	0	0	0	0	25	0	0	23	0	0	0	0	0							
Group, membranous.....	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0		3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
Diphtheria.....	7	5	4	13	8	7	0	0	3	0	0	0	0	7	4		9	9	8	0	0	0	50	50	27	0	0	0	0	0	0	0	0	0						
Diarrhea.....	27	22	35	25	12	11	8	7	42	46	70	77	45	14	29		50	45	44	38	25	44	25	38	36	44	70	62	40	33	60									
Dysentery.....	15	12	17	0	0	0	0	0	6	33	56	50	21	0	18	14	11	5	6	0	0	0	0	0	0	0	11	10	15	13	0	0								
Erysipelas.....	23	27	20	25	20	36	33	27	23	8	19	13	24	7	18	27	27	42	38	50	56	100	50	27	33	50	46	27	33	40										
Fever, intermittent.....	23	22	9	0	0	0	0	7	6	17	26	30	10	0	4	27	30	3	0	0	0	0	0	0	0	0	0	8	0	20	0	0								
Fever, remittent.....	11	13	6	5	0	0	0	20	16	0	4	3	10	3	7	9	3	16	0	0	0	0	0	0	0	0	0	23	33	27	70									
Fever, typhoid (enteric).....	8	8	1	0	0	0	0	0	0	8	0	3	3	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Fever, typho-malarial.....	6	4	3	0	18	0	0	0	0	0	0	0	3	0	3	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Influenza.....	35	35	48	75	72	82	92	87	32	8	11	23	21	41	79	52	58	52	63	50	56	100	50	55	44	50	31	27	60	80										
Kidney, inflammation of.....	18	20	16	33	12	4	25	27	19	13	4	20	10	7	25	38	38	53	50	50	56	100	50	45	44	60	46	27	60	80										
Measles.....	8	6	13	42	24	21	42	40	10	4	11	0	0	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Neuralgia.....	51	47	58	67	68	79	52	73	32	50	52	47	59	45	68	68	63	51	63	50	56	100	50	45	44	50	54	47	60	60										
Pleuritis.....	22	22	13	25	12	21	8	7	19	4	0	7	14	17	14	24	24	42	38	38	56	100	50	45	44	50	31	27	33	40										
Pneumonia.....	20	19	11	13	36	4	25	20	16	0	4	0	3	14	14	25	22	24	75	25	22	75	25	0	22	0	8	13	20	60										
Puerperal fever.....	6	4	2	5	0	0	0	25	7	3	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Rheumatism.....	59	57	74	88	92	86	83	87	65	79	63	70	62	59	68	67	63	74	100	75	100	100	50	73	56	60	69	73	73	80										
Scarlatina.....	4	4	11	17	8	14	25	0	6	17	4	3	14	14	14	7	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Smallpox.....	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	.07	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Tonsillitis.....	33	36	52	67	64	46	67	60	39	38	33	40	48	69	64	55	49	49	63	50	33	75	50	45	44	30	8	60	73	70										
Whooping-cough.....	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								

* + d. These notes on page 75. † Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 18 years, 1880-97, for neuralgia and tonsillitis, an average for the 19 years, 1879-97; pleuritis was not compiled until 1888; for other diseases and for the average line an average for the 21 years, 1877-97. For the Northwestern Division, 1879-97. For the Northeastern Division, 1882-97. For the Northern Division, 1882-97.

TABLE 2.—CONTINUED.—Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the year and by months in 1899; also an average for the period of 21 years, 1877-1897, and an average for the period of 12 years, 1886-1897—indicating what per cent of the weekly reports received stated the presence of the diseases named.*

Division.*	Diseases.	1877-97,†	1886-97.	1898-†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	23	19	13	19	20	14	19	9	8	9	15	13	7	12	15
Northern Central Division.*	Brain, inflammation of...	3	3	3	0	20	0	0	0	0	0	0	0	0	0	0
	Bowels, inflammation of...	48	45	3	3	10	0	0	6	0	0	0	0	0	0	0
	Bronchitis.....	5	45	28	63	70	30	36	22	0	16	21	10	31	43	50
	Cerebro-spi. meningitis ..	4	1	2	0	0	0	9	0	12	5	0	0	0	0	0
	Cholera infantum.....	12	13	6	0	0	0	0	11	21	14	0	0	0	0	0
	Cholera morbus.....	13	12	10	0	0	0	0	6	4	21	32	10	0	0	0
	Consumption, pulmonary	33	30	33	50	60	0	27	28	40	37	36	43	38	24	22
	Croup, membranous.....	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diphtheria.....	14	4	2	0	10	0	0	0	0	0	0	19	0	0	0
	Diarrhea.....	40	37	29	0	10	10	0	0	28	32	79	52	0	24	33
	Dysentery.....	15	14	17	0	0	10	0	0	12	21	64	38	0	0	0
	Erysipelas.....	21	16	10	0	10	20	9	0	12	0	4	10	8	14	33
	Fever, intermittent.....	52	43	17	25	20	0	27	22	4	0	25	33	0	14	33
	Fever, remittent.....	40	30	9	25	0	0	0	6	12	16	7	14	15	14	0
	Fever, typhoid (enteric) ..	10	9	13	0	0	0	0	0	0	11	21	19	8	14	0
	Fever, typho-malarial.....	16	8	1	0	0	0	0	0	0	0	0	0	23	0	0
	Infuenza.....	9	10	25	63	70	60	64	28	8	11	4	14	0	29	39
	Kidney, inflammation of	19	10	9	0	0	0	0	0	20	5	4	10	0	10	22
	Measles.....	11	8	9	25	30	30	27	6	16	0	4	0	0	33	50
	Neuralgia.....	53	51	27	50	50	20	45	17	8	21	25	19	23	0	0
	Neuritis.....	7	7	9	50	40	30	27	11	0	0	0	0	0	5	0
	Pneumonia.....	25	17	38	40	60	55	52	22	0	18	10	0	5	17	0
	Puerperal fever.....	5	6	2	0	0	0	0	0	0	4	0	0	0	0	0
	Rheumatism.....	57	56	46	50	50	60	73	41	52	26	43	38	31	52	50
	Scarlatina.....	8	4	25	10	0	0	0	0	11	0	0	0	0	0	0
	Smallpox.....	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis.....	47	41	26	50	60	50	73	6	4	11	18	71	15	32	33
	Whooping-cough.....	11	8	2	0	10	0	0	11	0	0	0	0	0	10	0

TABLE 2.—CONTINUED.—*Diseases in the Southwestern and Southern Central Divisions of the State, for the year and by months in 1898; also an average for the period of 21 years, 1877-1897, and an average for the period of 12 years, 1886-1897—indicating what per cent of the weekly reports received stated the presence of the diseases named.*^a

Diseases.	1877-97,†	1886-97.	1898,†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Av. for tab. dis. rep. pres.	26	24	15	41	19	12	41	13	11	14	18	15	14	15	41
Brain, inflammation of	4	3	2	3	3	3	7	8	2	0	0	2	0	4	2
Bowels, inflammation of	12	13	9	13	0	0	10	31	25	33	16	9	2	12	11
Bronchitis	54	43	38	48	29	54	38	31	0	2	0	0	0	46	57
Cerebro-spi. meningitis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cholera infantum	18	16	10	0	0	0	3	0	18	47	25	4	0	13	12
Cholera morbus	16	17	11	6	3	3	3	0	25	37	27	10	2	39	21
Consumption, pulmonary	57	45	17	19	33	21	21	4	8	14	18	17	30	11	9
Group, membranous	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Diphtheria	8	4	2	0	12	3	0	0	3	2	0	5	0	4	1
Diarrhea	38	26	9	15	15	32	3	3	10	61	64	35	24	67	46
Dysentery	15	16	11	3	0	5	0	0	14	32	36	13	7	25	17
Erysipelas	22	12	16	27	19	31	14	3	14	35	13	10	13	15	2
Fever, intermittent	60	43	31	32	30	33	29	33	25	37	39	31	30	30	27
Fever, remittent	40	32	16	10	9	21	10	16	13	12	28	10	20	16	12
Fever, typhoid (enteric)	6	6	3	16	0	0	0	0	0	5	9	0	0	9	11
Fever, typho-malarial	16	11	3	0	0	0	0	0	2	7	4	15	0	11	0
Influenza	46	47	48	74	70	79	59	61	38	25	20	44	54	67	87
Kidney, inflammation of	16	17	13	23	27	13	7	8	8	11	14	13	11	23	33
Measles	10	19	13	23	13	15	9	0	0	0	0	0	0	0	0
Neuralgia	68	63	47	65	67	67	31	45	47	16	42	32	50	59	60
Pleuritis	18	18	6	13	12	13	7	6	3	4	2	0	8	11	12
Pneumonia	29	27	15	39	42	46	31	19	2	4	7	7	4	9	12
Puerperal fever	3	4	2	0	3	5	7	2	5	16	0	0	0	0	0
Rheumatism	76	77	57	78	79	85	59	51	47	47	47	36	56	63	69
Scarlatina	11	9	6	6	9	0	0	0	0	11	7	11	2	5	0
Smallpox	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	45	46	26	39	42	41	24	35	32	25	18	14	17	31	54
Whooping-cough	13	11	8	0	0	0	0	0	17	23	19	7	4	4	0

^a, t. d. These notes on page 75. † Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 18 years, 1880-97; for neuralgia and tonsillitis, an average for the 19 years, 1879-97; pleuritis was not compiled until 1888; for other diseases, and for the average line, an average for the 21 years, 1877-97.

TABLE 2.—CONCLUDED.—Diseases in the Southeastern Division of the State, for the year and by months in 1898; also an average for the period of 21 years, 1877-1897, and an average for the period of 12 years, 1886-1897—indicating what per cent of the weekly reports received stated the presence of the diseases named.^a

Division.*	Diseases.	1877-97, †	1886-97.	1898, ‡	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
					17	15	14	16	14	11	15	12	17	14	19	15
Southeastern Division.*	Av. for tab. dis. rep. pres.	27	21	15												
	Brain, inflammation of.....	8														
	Bowels, inflammation of.....	15	11	1	11	0	0	0	0	0	0	0	0	0	3	0
	Bronchitis.....	62	57	53	63	68	52	52	55	49	29	40	45	47	71	14
	Cerebro-spinal meningitis.....	5	2	1	0	2	0	0	0	0	0	0	0	0	6	0
	Cholera infantum.....	12	9	7	0	4	0	8	0	0	0	9	17	28	18	3
	Cholera morbus.....	18	13	12	0	0	0	0	6	6	6	29	30	52	21	3
	Consumption, pulmonary.....	62	47	19	30	29	21	12	13	17	12	12	13	17	18	31
	Croup, membranous.....	8	4	0.8	4	0	0	4	0	0	0	0	0	0	0	3
	Diphtheria.....	19	9	5	19	4	0	0	3	6	0	6	0	0	6	11
	Diarrhea.....	47	38	25	15	14	12	24	6	20	4	43	43	45	29	31
	Dysentery.....	21	13	8	7	0	6	0	0	6	0	12	10	31	12	6
	Erysipelas.....	25	19	5	15	0	18	4	0	0	0	6	3	7	0	3
	Fever, intermittent.....	47	28	19	7	0	3	21	26	9	9	9	30	28	41	40
	Fever, remittent.....	30	18	7	0	0	0	12	0	6	15	7	7	17	9	9
	Fever, typhoid (enteric).....	18	13	13	7	7	9	8	3	0	12	7	14	24	29	36
	Fever, typho-malarial.....	16	7	1	0	0	0	4	0	0	0	3	0	7	0	3
	Influenza.....	43	38	32	37	46	39	52	42	31	21	20	17	12	21	31
	Kidney, inflammation of.....	22	22	9	7	4	3	0	0	11	12	10	7	6	17	25
	Measles.....	13	9	4	7	7	15	12	3	3	0	7	0	0	0	0
	Neuralgia.....	51	48	45	74	57	45	48	61	34	44	23	38	35	43	43
	Pleuritis.....	14	14	12	22	11	15	36	19	11	18	0	0	0	3	7
	Pneumonia.....	31	21	14	15	21	15	20	23	11	6	3	7	9	23	21
	Puerperal fever.....	7	4	2	0	0	0	0	0	0	0	0	0	0	0	6
	Rheumatism.....	67	62	67	59	68	61	72	87	69	82	53	66	65	65	69
	Scarlatina.....	19	11	9	15	18	6	4	3	0	0	15	13	0	6	29
	Smallpox.....	2	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis.....	44	42	34	41	39	45	48	35	23	24	17	28	26	46	36
	Whooping-cough.....	19	11	0.5	0	0	3	0	0	0	0	0	0	0	0	3

*. †. d. These notes on page 75. † Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 18 years, 1880-97; for neuralgia and tonsillitis, an average for the 19 years, 1879-97; pleuritis was not compiled until 1888; for other diseases and for the average line, an average for the 21 years, 1877-97.

TABLE 4.*—1 summary for the year 1898, relative to diseases in each of the 11 divisions of the State,—indicating the prevalence as regards both time and area.

Diseases.	Upper Peninsular Division.†				Northwestern Division.†				Northern division.†				Northeastern Division.†				Western Division.†			
	Per cent of observers reporting presence of b	Av. per cent of weeks reported present	Per cent of reports stating presence of d	Av. order of prevalence where present e	Per cent of observers reporting presence of b	Av. per cent of weeks reported present	Per cent of reports stating presence of d	Av. order of prevalence where present e	Per cent of observers reporting presence of b	Av. per cent of weeks reported present	Per cent of reports stating presence of d	Av. order of prevalence where present e	Per cent of observers reporting presence of b	Av. per cent of weeks reported present	Per cent of reports stating presence of d	Av. order of prevalence where present e	Per cent of observers reporting presence of b	Av. per cent of weeks reported present	Per cent of reports stating presence of d	Av. order of prevalence where present e
Av. for tab. dis. reported present	31	70	55	3.7	26	60	16	2.4	86	62	17	2.4	26	83	20	2.8	85	63	18	2.6
Brain, inflammation of	6	47	3	3.3	12	31	4	3.0	5	24	1	3.3	6	22	2	3.0	4	40	4	3.0
Bowels, inflammation of	36	38	14	4.5	24	47	12	2.7	16	33	5	3.5	48	44	66	3.1	62	40	45	3.1
Bronchitis	71	89	63	2.5	64	75	49	2.5	86	69	59	2.3	65	96	8	2.1	71	71	45	2.1
Cerebro-spinal meningitis	13	37	5	4.4	4	27	1	3.0	3	38	2	3.3	3	25	0.8	2.0	4	33	8	2.0
Cholera infantum	24	55	13	3.1	15	62	10	2.1	11	39	4	2.3	10	40	3	1.8	46	46	10	1.8
Cholera morbus	36	58	23	4.3	20	47	10	2.2	19	41	8	2.3	13	47	6	2.0	41	33	10	2.0
Consumption, pulmonary	43	88	36	3.9	7	89	6	1.6	11	66	1	1.9	10	64	6	3.0	37	85	22	3.0
Croup, membranous	7	35	6	6.2	1	25	0.4	2.0	0	0	0	0	0	0	0	2.0	40	0	0	2.0
Diphtheria	11	44	6	5.6	1	25	0.7	2.0	8	50	4	2.1	0	69	8	4.0	5	56	0	4.0
Dysentery	72	77	57	3.0	53	60	33	2.7	28	68	35	2.3	61	66	43	1.8	65	50	12	1.8
Erysipelas	32	52	17	5.0	26	47	13	2.9	52	67	17	2.3	33	44	5	3.3	32	50	18	3.3
Fever, intermittent	6	50	3	4.5	31	54	14	2.0	35	55	20	2.6	42	91	42	1.8	37	56	24	1.8
Fever, remittent	4	38	2	5.0	22	54	13	2.1	13	56	9	2.3	10	31	3	3.3	43	56	21	3.3
Fever, typhoid (enteric)	29	67	19	4.8	22	39	9	2.3	26	59	16	2.5	26	59	16	3.3	39	63	15	3.3
Fever, typho-malarial	4	29	4	6.0	0	25	1	2.7	4	44	6	2.0	0	0	0	3.0	16	65	10	3.0
Influenza	69	85	60	1.7	64	67	44	1.9	67	70	38	1.6	0	0	0	0	8	48	4	0
Kidney, inflammation of	38	62	26	4.7	28	61	19	2.7	52	91	52	2.3	52	91	52	1.4	57	78	46	1.4
Measles	10	63	6	3.0	16	60	10	2.3	33	46	13	3.3	33	91	53	3.1	28	46	19	3.1
Neuritis	65	84	57	3.4	69	75	52	3.0	65	80	58	2.4	65	77	54	2.2	60	60	19	2.2
Pleuritis	17	34	6	5.3	41	46	20	3.3	30	41	13	2.8	45	82	42	3.7	30	38	17	3.7
Pneumonia	57	56	33	4.0	42	56	24	3.5	28	40	11	3.8	45	51	24	3.6	33	47	17	3.6
Puerperal fever	7	35	3	6.3	6	45	7	3.1	6	35	2	5.8	0	0	0	0	5	31	1	0
Rheumatism	4	71	2	6.0	59	73	43	3.1	91	81	74	2.3	81	87	71	2.0	78	79	62	2.0
Scarlatina	67	85	56	3.7	37	53	3	2.4	19	54	11	3.3	3	75	3	3.0	9	58	0	3.0
Smallpox	4	0	0	6.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	78	83	68	3.0	64	64	42	2.4	81	63	52	2.3	61	74	49	3.2	57	70	41	3.2
Whooping-cough	19	82	15	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Table 3 is manuscript, not printed for lack of space. † Counties in each division are stated in Exhibit I, in preceding reports, b, c, d, e. Foot-notes with these marks are below Table 2.

TABLE 4.— CONCLUDED.

Diseases.	Northern Central Division.*				Bay and Eastern Division.*				Central Division.*				Southwestern Div.*				Southern Central Division.*				Southeastern Div.*				
	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	Per cent of observers re- porting presence of b	Av. per cent of weeks re- ported present where present c	Per cent of reports stat- ing presence of d	Av. order of prevalence where present e	
Av. for tab. dis. rep. present...	22	56	13	2.2	25	61	15	2.6	28	65	18	2.8	24	62	15	2.5	27	65	18	2.8	24	61	15	1.8	
Brain, inflammation of.....	7	58	3	3.5	2	40	0.5	3.3	4	38	2	4.8	6	26	2	4.6	5	40	2	3.4	2	50	1	1.5	
Bowels, inflammation of.....	11	33	3	2.5	64	42	9	3.5	27	42	11	3.3	22	36	9	3.6	24	53	13	3.2	70	37	8	2.0	
Bronchitis.....	50	58	28	2.2	9	42	3	3.6	7	79	38	2	2.9	74	38	1.3	64	53	13	3.2	29	37	8	1.6	
Cerebro-spinal meningitis.....	7	29	2	2.5	9	42	3	3.6	7	79	38	2	2.9	74	38	1.3	64	53	13	3.2	29	37	8	1.6	
Cholera infantum.....	13	41	6	2.1	19	56	10	2.7	20	50	10	3.0	15	36	0.7	1.3	5	43	2	3.5	4	42	1	2.0	
Cholera morbus.....	19	50	10	2.4	25	50	12	2.5	21	44	10	2.9	13	60	10	3.0	25	47	15	3.2	17	43	7	1.9	
Consumption, pulmonary.....	37	93	33	1.8	20	58	12	2.6	37	83	31	2.9	19	90	17	2.7	22	56	17	3.2	25	48	12	2.5	
Croup, membranous.....	0	0	0	0.5	25	25	0.1	1.0	37	87	0.6	4.2	3	33	0.4	2.5	0.9	50	0	3.9	66	19	2.3	1.4	
Diphtheria.....	6	56	2	3.3	8	46	4	2.1	3	47	2	3.8	1	6	2	2.8	7	50	4	3.0	3	33	0	2.3	
Diarrhea.....	4	55	3	3.8	5	65	35	2.2	63	63	40	4	3.3	6	43	2	2.6	7	45	4	13	39	5	1.4	
Dysentery.....	46	59	29	1.7	55	65	35	2.2	63	63	40	4	3.3	6	43	2	2.6	7	45	4	13	39	5	1.4	
Erysipelas.....	22	65	17	2.2	21	52	10	3.0	24	40	9	3.1	20	50	11	3.3	19	37	10	2.9	47	55	1	1.9	
Fever, intermittent.....	24	39	10	4	24	49	11	3.5	27	48	13	3.1	19	50	11	3.3	19	37	10	2.9	47	55	1	1.9	
Fever, remittent.....	30	60	17	2.3	31	51	16	2.6	36	56	21	2.8	32	52	16	2.7	32	52	15	3.3	30	61	19	1.9	
Fever, typhoid (enteric).....	26	35	9	3.3	8	43	4	2.3	68	68	19	3.8	27	61	3	3.2	27	52	15	3.3	32	51	13	1.8	
Fever, typho-malarial.....	19	46	9	1.7	12	52	6	2.7	48	6	3	3.5	16	69	3	1.6	16	69	3	1.6	21	61	13	1.4	
Influenza.....	25	75	1	1.0	3	11	1	2.0	9	47	4	3.8	5	61	3	1.6	16	69	3	1.6	21	61	13	1.4	
Kidney, inflammation of.....	37	68	25	1.8	59	72	42	1.6	63	74	47	2	3.8	6	64	3	1.8	58	77	45	1.8	46	66	22	1.6
Measles.....	19	44	9	2.4	29	62	18	3.3	52	15	3	3.0	24	48	13	1.8	58	77	45	1.8	46	66	22	1.6	
Neuritis.....	17	45	9	1.7	11	49	5	1.6	7	51	4	3.2	61	76	48	1.8	58	77	45	1.8	46	66	22	1.6	
Pneumonia.....	50	54	27	2.3	67	69	46	2.5	79	62	19	3.1	23	51	9	1.7	34	63	23	3.2	16	55	9	2.1	
Rheumatism.....	19	45	9	3.0	34	59	20	3.4	34	55	19	3.6	13	78	47	1.7	12	78	47	1.7	8	48	4	1.0	
Rheumatoid fever.....	30	58	17	2.7	26	6	48	12	3.5	31	55	19	3.6	13	42	2.6	35	49	17	3.6	21	52	12	1.9	
Scarlatina.....	6	38	2	3.0	6	31	2	3.2	4	40	2	3.0	7	32	2	2.3	2	29	0.5	4.4	3	60	2	1.0	
Smallpox.....	70	65	46	2.1	71	80	57	2.2	66	82	57	2.3	83	82	57	2.3	83	82	57	2.3	76	67	17	1.8	
Tonsillitis.....	7	62	4	2.8	10	52	5	1.7	12	53	6	2.0	6	53	6	2.0	6	38	2	2.0	16	52	9	1.8	
Whooping-cough.....	50	50	26	2.4	55	63	34	2.8	58	65	38	2.6	0	45	0	0	0	6	0	0	0	52	9	1.0	
	6	56	2	1.7	12	54	7	1.7	7	74	6	2.6	11	64	8	1.6	10	53	6	2.6	2	33	0.5	1.5	

* Counties in each division are stated in Exhibit I, in preceding reports.

b, c, d, e. Foot-notes with these marks are below Table 2.

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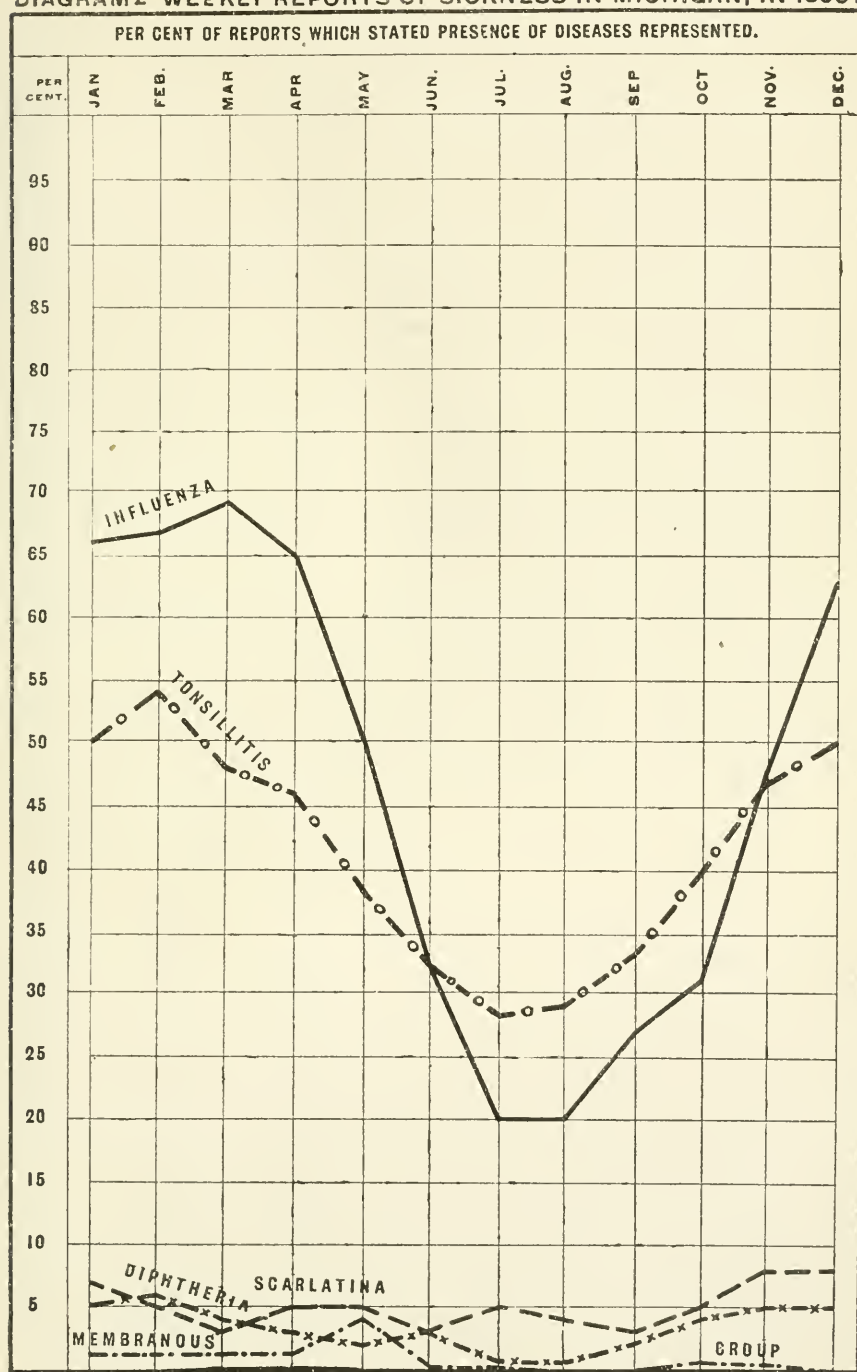
DISEASES IN MICHIGAN, ARRANGED IN ORDER OF PREVALENCE, THOSE WHICH CAUSED MOST SICKNESS FIRST.

EXHIBIT A.—*Order of prevalence of 28 diseases in Michigan, in the period of 13 years, 1886-1898, and in each of those years, judging from the "per cent of reports," which stated the presence of each of the diseases, in connection with the reported "order of prevalence" when and where each disease was present. (The method of rating diseases for this exhibit is described and illustrated in a "compiling table" on pages 122 and 123 of the annual report for 1890.)*

Order, 1886-98.	Diseases arranged in order of greatest prevalence.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
1	Rheumatism	1	1	1	3	1	1	2	2	1	1	1	1	1
2	Neuralgia	3	3	2	1	2	2	1	3	2	2	2	2	2
3	Bronchitis	4	4	4	4	3	4	3	4	3	3	3	3	3
4	Influenza	2	2	3	2	4	3	4	1	4	8	8	8	8
5	Diarrhea	5	6	6	5	5	6	5	5	5	4	6	6	7
6	Tonsillitis	6	5	5	6	6	5	6	6	7	7	7	7	6
7	Intermittent fever	8	10	8	7	8	7	7	8	8	5	4	5	4
8	Consumption, pulmonary	10	11	7	10	7	8	9	7	6	6	5	4	5
(9)	(The average disease)	9	10	7	8	9	10	9	10	9	10	11	11	10
9	Remittent fever	12	20	9	9	9	9	8	9	9	9	9	9	9
10	Whooping-cough	9	8	11	8	10	11	10	10	13	11	20	19	12
11	Pneumonia	18	18	10	16	16	12	11	13	10	10	10	10	10
12	Cholera morbus	23	14	12	11	12	13	14	12	12	15	15	12	14
13	Measles	11	7	14	18	11	10	16	11	11	22	12	16	22
14	Dysentery	15	16	13	13	13	17	17	17	14	13	13	13	15
15	Inflammation of kidney	17	21	16	14	17	16	12	14	15	14	16	15	13
16	Cholera infantum	14	13	17	12	15	15	15	15	17	18	18	18	17
17	Erysipelas	20	22	20	23	21	21	21	19	15	12	11	11	11
18	Typho-malarial fever	24	12	21	20	23	22	22	20	19	17	14	14	16
19	Scarlet fever	13	19	18	19	14	19	13	22	22	21	22	22	20
20	Typhoid fever (enteric)	16	25	19	17	18	14	20	16	20	20	21	21	21
21	Pleuritis*	19	26	15	21	22	20	19	18	18	16	17	-----	-----
22	Inflammation of bowels	21	23	22	22	20	23	23	21	21	19	19	17	18
23	Diphtheria	22	15	24	27	19	18	18	23	23	24	23	20	19
24	Smallpox	7	9	28	15	26	28	28	28	28	28	28	27	27
25	Puerperal fever	25	24	23	24	24	24	26	25	24	23	24	23	24
26	Membranous croup	28	17	26	28	27	25	27	24	25	26	26	25	25
27	Cerebro-spinal meningitis	26	28	25	25	25	27	24	27	26	25	25	26	26
28	Inflammation of brain	27	27	27	26	28	26	25	26	27	27	27	24	23

* Pleuritis was not compiled until 1888.

DIAGRAM 2—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1898.



Diseases which cause most sickness in Michigan.

This is shown in this report in Exhibit A, and more specifically in Exhibit III., in this report, and in similar exhibits in previous reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan.

By Exhibit A, one may see that in the year 1885 neuralgia, in the years 1886-90 rheumatism, in 1891 influenza, in 1892 neuralgia, in 1893-94 rheumatism, in 1895 neuralgia, and in 1896-8 rheumatism appeared to have caused most sickness in Michigan. This does not necessarily imply that there was an increase in rheumatism or neuralgia, because one disease *may* exhibit a higher relative order of prevalence on account of some other disease or diseases having been actually lessened in prevalence.

The "average disease" of those reported, is included in Exhibit A, as a standard by which to judge the fluctuations. It may be seen that in 1890, the "average disease" was higher (9) by one-tenth, than the average (10) of a series of years; in 1891 it was lowered to the average; in 1892 it was again higher by one-tenth than the average; in 1893 it was again lowered to the average; in 1894 it was again one-tenth higher, in 1895 it was two-tenths higher, in 1896 it was three-tenths higher than the average, in 1897 it was lowered to the average, and in 1898 it was again one-tenth higher.

In this connection it should be stated that the average number of diseases reported on each card has gradually decreased for the past thirteen years. This is shown in Exhibit B, as follows:—

EXHIBIT B.—*Stating for each of the 13 years, 1886-98, the number of card reports received, the total number of disease reports and the average number of diseases reported on each card; also the averages for the 12 years, 1886-97.*

Year.	Number of card reports received.	Number of disease reports.	Av. number of diseases on each card.
1886	5,583	38,640	6.92
1887	4,896	33,048	6.75
1888	5,047	33,270	6.59
1889	5,000	32,612	6.52
1890.....	4,939	33,934	6.87
1891.....	4,291	28,741	6.70
1892	5,281	31,269	5.92
1893	5,853	32,723	5.59
1894.....	5,572	30,619	5.50
1895	4,394	24,004	5.46
1896	3,940	19,443	4.93
1897.....	4,418	21,828	4.94
Average for the 12 years, 1886-97.....	4,935	30,011	6.06
1898	5,219	24,946	4.78

EXHIBIT III.—*Diseases from which there seems to have been the most sickness in Michigan in 1898, as indicated by the per cent of weekly reports stating presence of the diseases, as studied in connection with the average order of prevalence of said diseases when reported present; also order, per cent of reports and average order for the same diseases in 1897, 1896, 1895 and 1894.*

	Order.*	1898.		Order.*	1897.		Order.*	1896.		Order.*	1895.		Order.*	1894.	
		Diseases in order of apparent amount of sickness in 1898. Most prevalent disease first.	Per cent of reports stating presence of, d Av. order of prevalence when present, e		Diseases in order of apparent amount of sickness in 1897. Most prevalent disease first.	Per cent of reports stating presence of, d Av. order of prevalence when present, e		Diseases in order of apparent amount of sickness in 1896. Most prevalent disease first.	Per cent of reports stating presence of, d Av. order of prevalence when present, e		Diseases in order of apparent amount of sickness in 1895. Most prevalent disease first.	Per cent of reports stating presence of, d Av. order of prevalence when present, e		Diseases in order of apparent amount of sickness in 1894. Most prevalent disease first.	Per cent of reports stating presence of, d Av. order of prevalence when present, e
More sickness than av. for 28 diseases.	1	Rheumatism.....	62 2.2	1	66 2.3	1	60 2.3	3	60 2.7	1	62 2.6	1	62 2.6	1	62 2.6
	2	Influenza.....	45 1.7	2	47 1.8	2	44 1.8	2	44 2.0	2	44 2.5	2	44 2.5	2	41 2.2
	3	Neuralgia.....	54 2.3	3	58 2.4	3	54 2.3	1	56 2.5	3	56 2.5	3	56 2.5	3	50 2.6
	4	Bronchitis.....	49 2.5	4	50 2.6	4	51 2.4	4	52 2.6	4	52 2.6	4	52 2.6	4	50 2.6
	5	Diarrhea.....	36 2.4	6	34 2.5	6	34 2.5	5	42 2.5	5	42 2.5	5	42 2.5	5	40 2.5
	6	Tonsillitis.....	40 2.7	5	43 2.6	5	45 2.6	6	43 3.0	6	43 3.0	6	43 3.0	6	42 3.0
	7	Smallpox.....	.04 2.0	9	.05 2.0	28	4 6.3	15	0.3 2.8	26	0.6 4.1	26	0.6 4.1	26	0.6 4.1
	8	Intermittent fever.....	19 2.6	10	17 2.7	8	19 2.7	7	22 2.9	8	24 2.9	8	24 2.9	8	24 2.9
	(9)	Average.....	17 2.6	(10)	17 2.7	(7)	18 2.7	(8)	20 3.0	(9)	20 3.0	(9)	20 3.0	(9)	20 3.0
Less than said average.	9	Whooping-cough.....	5 2.4	8	4 2.1	11	7 2.4	8	9 2.6	10	12 2.9	10	12 2.9	10	12 2.9
	10	Consumption, pulmonary.....	20 2.9	11	20 3.1	7	23 3.0	10	29 3.5	7	36 3.4	7	36 3.4	7	36 3.4
	11	Measles.....	7 2.7	7	13 2.3	14	7 2.7	18	4 3.1	11	6 2.8	11	6 2.8	11	6 2.8
	12	Remittent fever.....	13 2.9	20	11 3.2	9	16 2.9	9	20 3.1	9	20 3.1	9	20 3.1	9	20 3.1
	13	Scarlet fever.....	5 2.7	19	4 3.0	18	8 3.1	19	12 3.5	14	14 3.3	14	14 3.3	14	14 3.3
	14	Cholera infantum.....	8 2.8	13	8 2.9	17	8 2.9	12	12 3.0	15	12 3.3	15	12 3.3	15	12 3.3
	15	Dysentery.....	12 3.0	16	12 3.2	13	11 3.0	13	15 3.2	13	14 3.3	13	14 3.3	13	14 3.3

Judging from the per cent of reports which stated presence of the diseases in connection with the order of prevalence when present. The method of rating diseases, as causes of sickness, as shown in Exhibits VI. and VII., is fully described and illustrated by a "compiling table" on pages 122 and 123 of the annual report for the year 1890.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received, for the time specified, from all observers in the State. It combines and states in a general way, an idea of the time a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order: the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the order of prevalence columns in Table 3 (omitted from this report because of lack of room), by the number of observers who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of observers who reported the different diseases present, thus counting each observer once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present, by each observer, from week to week, the greater will be the average in this column.

EXHIBIT IV.—In each of 11 geographical divisions of the State the 15 diseases from which there seems to have been the greatest amount of sickness in 1898, as indicated by the per cent of weekly reports stating presence of each of 28 leading diseases, when studied in connection with the average order of prevalence of said diseases when reported present.

	Order.*	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of d		Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of d		Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of d	
			Av. order of preva- lence when pres. e		Av. order of preva- lence when pres. e		Av. order of preva- lence when pres. e		Av. order of preva- lence when pres. e	
More sickness than av. for 28 diseases.		UPPER PEN'SLAR DIV.†			NORTHWESTERN DIV.†			NORTHERN DIVISION.†		
	1	Influenza.....	60	1.7	Influenza.....	41	1.9	Rheumatism.....	74	2.2
	2	Bronchitis.....	63	2.5	Neuralgia.....	52	2.3	Influenza.....	48	1.6
	3	Tonsillitis.....	68	3.0	Rheumatism.....	43	2.3	Bronchitis.....	59	2.3
	4	Diarrhea.....	57	3.0	Bronchitis.....	49	2.5	Tonsillitis.....	52	2.3
	5	Neuralgia.....	57	3.4	Tonsillitis.....	42	2.4	Neuralgia.....	58	2.5
	6	Rheumatism.....	56	3.7	Diarrhea.....	33	2.2	Diarrhea.....	35	2.1
	7	Consumption, pul...	36	3.9	Consumption, pul...	6	1.6	Consumption, pul...	7	1.9
	(8)	Average.....	22	3.7						
	8	Cholera infantum...	13	3.1	Intermittent fever...	18	2.0	Dysentery.....	17	2.3
	9	Pneumonia.....	33	4.5	Remittent fever...	13	2.1	Typho-mal fever...	3	2.0
	10	Measles.....	6	3.0	Pneumonia.....	24	2.5	Typhoid fev. (ent.)...	1	2.0
	(11)							Average.....	17	2.4
	11	Cholera morbus.....	23	4.3	Cholera infantum...	10	2.1	Scarlet fever.....	11	2.3
	(12)				Average.....	16	2.4			
Less than said average.	12	Inflam. of kidney...	26	4.7	Cholera morbus.....	10	2.2	Measles.....	13	2.4
	13	Inflam. of brain...	3	3.3	Diphtheria.....	0.7	2.0	Diphtheria.....	4	2.2
	14	Whooping-cough...	15	4.2	Membran. croup...	0.4	2.0	Cholera morbus...	8	2.3
	15	Typhoid fev. (ent.)...	19	4.8	Measles.....	10	2.3	Cholera infantum...	4	2.3
More sickness than av. for 28 diseases.		NORTHERN CEN. DIV.†			WESTERN DIVISION.†			NORTHEASTERN DIV.†		
	1	Rheumatism.....	46	2.1	Rheumatism.....	62	2.1	Rheumatism.....	74	2.0
	2	Consumption, pul...	33	1.8	Influenza.....	46	1.5	Influenza.....	52	1.4
	3	Diarrhea.....	29	1.7	Neuralgia.....	57	2.2	Bronchitis.....	66	2.1
	4	Influenza.....	25	1.8	Diarrhea.....	43	2.4	Neuralgia.....	54	2.2
	5	Bronchitis.....	28	2.1	Tonsillitis.....	41	2.7	Inflam. of kidney...	53	3.1
	6	Neuralgia.....	27	2.3	Bronchitis.....	45	2.9	Tonsillitis.....	49	3.2
	7	Typho-mal. fever...	1	1.0	Whooping-cough...	2	1.0	Dysentery.....	5	1.8
	8	Tonsillitis.....	26	2.4	Measles.....	9	1.7	Diarrhea.....	44	3.2
	9	Typhoid fev. (ent.)...	9	1.7	Intermittent fever...	24	2.6	Cholera morbus...	6	2.0
	(10)							Average.....	20	2.8
	10	Measles.....	9	1.7	Remittent fever...	25	2.9	Cholera infantum...	3	2.3
	(11)				Average.....	18	2.6			
	11	Dysentery.....	17	2.2	Cholera infantum...	8	2.3	Erysipelas.....	42	3.8
	12	Intermittent fever...	17	2.3	Membran. croup...	0.4	2.0	Pleuritis.....	42	3.8
	(13)	Average.....	13	2.2						
Less than said average.	13	Whooping-cough...	2	1.7	Pneumonia.....	17	2.8	Remittent fever...	16	3.3
	14	Pneumonia.....	17	2.7	Dysentery.....	12	2.6	Pneumonia.....	24	3.6
	15	Cholera infantum...	6	2.1	Consumption, pul...	22	3.2	Inflam. of bowels...	23	3.7

EXHIBIT IV.—CONCLUDED.

	Order.*	Diseases in order of apparent amount of sickness. Most prevalent disease first.		Diseases in order of apparent amount of sickness. Most prevalent disease first.		Diseases in order of apparent amount of sickness. Most prevalent disease first.	
		Per cent of reports stating presence of d.	Av. order of preva- lence when pres. e	Per cent of reports stating presence of d.	Av. order of preva- lence when pres. e	Per cent of reports stating presence of d.	Av. order of preva- lence when pres. e
More sickness than av. for 28 diseases.		BAY AND EASTERN DIV.†		CENTRAL DIVISION.†		SOUTHWESTERN DIV.†	
	1	Rheumatism.....	57 2.2	Rheumatism.....	67 2.2	Rheumatism.....	57 2.2
	2	Influenza.....	42 1.6	Neuralgia.....	62 2.4	Influenza.....	48 1.8
	3	Neuralgia.....	46 2.5	Influenza.....	47 2.0	Neuralgia.....	47 2.3
	4	Diarrhea.....	35 2.2	Bronchitis.....	58 2.6	Bronchitis.....	38 2.2
	5	Bronchitis.....	43 2.8	Diarrhea.....	40 2.4	Intermittent fever.....	31 2.2
	6	Membran. croup.....	0.1 1.0	Tonsillitis.....	38 3.0	Tonsillitis.....	26 2.3
	7	Tonsillitis.....	34 2.8	Consumption, pul.....	31 2.9	Diarrhea.....	26 2.6
	8	Measles.....	5 1.6	Intermittent fever.....	21 2.8	Whooping-cough.....	8 1.6
	9	Whooping-cough.....	7 1.7	Smallpox.....	0.2 2.0	Measles.....	9 1.7
	(10)	.....	.....	Average.....	18 2.8	.....	.....
	10	Scarlet fever.....	5 1.7	Remittent fever.....	19 3.0	Cerebro-spi. men.....	0.7 1.3
	11	Intermittent fever.....	16 2.6	Whooping-cough.....	6 2.6	Typhoid fev. (ent.).....	3 1.6
	(12)	Average.....	15 2.6	.....	.....	Average.....	15 2.5
	12	Diphtheria.....	4 2.1	Inflam. of kidney.....	15 3.0	Consumption, pul.....	17 2.7
Less.	13	Cholera morbus.....	12 2.5	Cholera morbus.....	10 2.9	Typho-mal fever.....	3 2.0
	14	Typho-mal fever.....	1 2.0	Dysentery.....	13 3.1	Cholera morbus.....	11 2.5
	15	Consumption, pul.....	12 2.6	Cholera infantum.....	10 3.0	Scarlet fever.....	6 2.3
More sickness than average for 28 diseases.		SOUTH'N CENTRAL DIV.†		SOUTHEASTERN DIVISION.†			
	1	Rheumatism.....	69 2.3	Rheumatism.....	.....	.....	67 1.8
	2	Neuralgia.....	63 2.3	Bronchitis.....	.....	.....	53 1.6
	3	Influenza.....	45 1.8	Neuralgia.....	.....	.....	45 1.6
	4	Tonsillitis.....	49 2.1	Influenza.....	.....	.....	32 1.6
	5	Bronchitis.....	46 2.9	Measles.....	.....	.....	4 1.0
	6	Diarrhea.....	31 2.4	Typhoid fever, (enteric).....	.....	.....	13 1.4
	(7)	Average.....	18 2.8	.....	.....	.....	.....
	7	Consumption, pul.....	17 2.9	Tonsillitis.....	.....	.....	34 2.1
	8	Inflam. of kidney.....	23 3.2	Diarrhea.....	.....	.....	25 1.9
	9	Whooping-cough.....	6 2.6	Diphtheria.....	.....	.....	5 1.4
	10	Measles.....	8 2.7	Pneumonia.....	.....	.....	14 1.7
	11	Intermittent fever.....	18 3.2	Intermittent fever.....	.....	.....	19 1.9
	(12)	.....	.....	Average.....	.....	.....	15 1.8
	12	Dysentery.....	10 2.9	Inflammation of brain.....	.....	.....	1 1.5
Less.	13	Cholera morbus.....	15 3.2	Whooping-cough.....	.....	.....	0.5 1.5
	14	Pneumonia.....	19 3.4	Cholera morbus.....	.....	.....	12 1.9
	15	Inflam. of bowels.....	13 3.2	Pleuritis.....	.....	.....	12 1.9

*, d. e. Foot-notes with these marks are under Exhibit III.

†The counties in each division are stated in Exhibit I, in preceding reports.

EXHIBIT V.—*Showing comparisons between the averages of certain meteorological conditions at the stations in Michigan in 1898, with those in preceding years. (Abstracted from Exhibits 8, 12, 15, 16, 19, 22, 23, 24, 25 and 28, on preceding pages of this report.)*

Meteorological conditions.	Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average temperature.....	1.28	4.19	1.06	6.94	-----	.70	1.36	1.25	1.36	2.67	.85	-----	-----
In 1898 higher than av. for 21 years, 1877-97.....													
Lower.....					1.07							.70	3.29
Av. daily range of temp.....							.68	1.63				.01	-----
In 1898 greater than av. for 19 years, 1879-97.....													
Less.....	.82	.55	2.60	.42	1.57	1.32			1.00	.02	2.78		.96
Absolute humidity.....													
In 1898 more than av. for 21 years, 1877-97.....		.11	.01	.51		.25			.29	.38	.26		
Less.....					.17			.03				.10	.34
Relative humidity.....													
In 1898 more than av. for 20 years, 1878-97.....	1				1	4	1		2		4	0	
Less.....		2	1	1				3		1			1
Rainfall.....							.24		.19		1.40		
In 1898 more than av. for 21 years, 1877-97.....		.76	.09	1.08									
Less.....	1.26				.91	1.15		1.64		.93		.58	.59
Velocity of wind.....													
In 1898 greater than av. for 16 years, 1882-97.....	0	0	.3				.5				.6	.6	1.3
Less.....				.5	.5	.4		.5	.7	.1			
Cloudiness.....													
In 1898 greater than av. for 21 years, 1877-97.....	1	0	13	0		0			5		15		3
Less.....					1		5	11		5		1	
Day ozone.....													
In 1898 more than av. for 21 years, 1877-97.....	.09	.15	.37	.21					.40	.03	.43	.08	.64
Less.....					.43	.03	.37	.38					
Night ozone.....													
In 1898 more than av. for 21 years, 1877-97.....	.26		.38			.07		.06	1.12	.28	.83	.21	.53
Less.....		.07		.08	.19		.11						
Atmospheric pressure.....													
In 1898 greater than av. for 21 years, 1877-97.....				.019	.002			.017					
Less.....	.053	.125	.059			.071	.026		.063	.076	.064	.075	.118

CLIMATE AND SICKNESS.*

Exhibit VII. (and similar exhibits in previous reports) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each meteorological condition was above or below its average for the year, in months when more or in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the prevalence of bronchitis; those months in which most bronchitis was reported being placed first in the column; those in which more bronchitis than the average was reported are placed above the average line; the others below that line. The meteorological conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its annual average in months when more than the average amount of bronchitis was reported, or *vice versa*.

That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions, grouping the conditions into two classes. The letters *a* and *b* in the exhibit mark exceptions to these propositions. It is not supposed that the propositions are in every case true concerning every disease; but the propositions serve to bring out the evidence of the exhibit on the subject in question. This evidence is appreciated by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XI, near the close of this article.

Propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. The propositions are differently stated for the summer diseases and for the winter diseases, but they are not changed to fit the individual diseases under each class.

*Relations of bronchitis and other "cold-weather" diseases to meteorological conditions.**

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, pulmonary consumption or average disease, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit VII, the letter *a* marks exceptions to this proposition for the year 1898.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism,

*A comparison of meteorological conditions in 1898, with the averages for series of years, is given in Exhibit V. of this article.

neuralgia, pleuritis, pulmonary consumption or average disease, the average daily temperature, the average daily range of temperature*, the absolute humidity of the atmosphere and the average daily pressure of the atmosphere* were less than the average for the year; and in months when less than the average per cent of reports stated the presence of bronchitis (or of the other diseases named), these conditions were greater than the average for the year. In Exhibit VII., the letter *b* marks exceptions to this proposition for months in 1898.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 2, it is true also that the quantity of vapor inhaled daily was less than the average, and the quantity exhaled daily in excess of that inhaled was greater than the average in months where more than the average per cent of reports stated presence of bronchitis; and that more vapor was inhaled and a less excess exhaled daily in months when the per cent of reports stating presence of bronchitis was less than the average.

What per cent of the weekly reports received stated presence of pneumonia, and of seven of the other diseases mentioned in the two preceding propositions by months in the years 1877-98, is stated in Exhibit VIII.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877-98, is shown in the following exhibit:

EXHIBIT VI.—SICKNESS FROM BRONCHITIS, 1877-98.—*By year and months for each of the 22 years, 1877-98, and an average for the 21 years, 1877-97, also for the 12 years, 1886-97; stating on what per cent of the weekly reports received Bronchitis was reported present, and comparing the per cents of 1898, with the averages for corresponding months in those years.*

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average, 21 years, 1877-97.....	58	71	73	72	68	58	50	41	40	46	53	62	67
Average, 12 years, 1886-97.....	55	67	69	68	65	56	47	39	39	44	52	58	62
1877.....	55	76	72	72	65	45	31	25	22	37	48	71	77
1878.....	64	77	75	74	71	65	56	41	45	55	60	73	81
1879.....	64	83	87	83	78	65	54	40	41	50	59	65	77
1880.....	64	81	84	82	68	59	57	44	45	46	57	67	72
1881.....	62	86	86	80	78	62	53	38	37	44	44	66	68
1882.....	65	73	70	75	74	70	62	51	44	57	59	71	71
1883.....	66	77	80	82	76	70	62	56	53	53	57	61	69
1884.....	61	71	71	71	65	59	56	48	47	50	56	69	70
1885.....	56	73	74	76	73	56	52	44	39	45	51	58	64
1886.....	56	71	69	71	65	57	45	40	37	41	51	61	65
1887.....	55	67	69	67	62	57	49	41	38	47	57	57	61
1888.....	59	63	76	74	68	63	55	41	39	49	59	59	65
1889.....	58	65	68	60	68	61	50	49	44	51	57	64	62
1890.....	65	71	74	76	74	66	56	50	52	54	65	73	79
1891.....	60	81	79	81	76	64	48	43	36	44	48	57	68
1892.....	54	72	70	64	67	56	47	37	38	42	50	57	63
1893.....	53	67	67	62	64	54	42	35	34	39	48	61	62
1894.....	50	63	60	61	58	49	42	32	36	43	52	53	57
1895.....	52	66	71	70	66	56	47	34	34	35	44	52	52
1896.....	51	59	60	59	56	45	39	36	35	46	53	59	61
1897.....	50	59	66	63	60	46	46	35	40	41	43	47	53
1898.....	49	58	51	54	56	47	38	33	38	41	52	59	64
In 1898 less than average 1877-97.....	9	13	22	18	12	11	12	8	2	5	1	3	3
In 1898 greater than average 1886-97+.....	—	—	—	—	—	—	—	—	—	—	—	1	2
In 1898 less than average 1886-97+.....	6	9	18	14	9	9	9	6	1	3	0	—	—

*The statements relative to the average daily range of temperature and the average daily pressure of the atmosphere were taken from proposition 1 and inserted in proposition 2 in the statistical study of sickness in Michigan in 1893, annual report for 1894.

+This comparison is made because of change of plan of reports in May, 1895, as explained on page 59.

EXHIBIT VII.—BRONCHITIS.—*Stating for the year and for each month of the year 1898, what per cent of the weekly reports of sickness stated presence of Bronchitis and what were the meteorological conditions as observed at stations in Michigan.**

BRONCHITIS.		Tempera- ture, F.				Humidity of air, § Av. of 3 daily ob- servations.		Vapor inhaled and exhaled from the air passages by one per- son in 24 hours, troy ounces.		Ozone, relative, Scale of 10°.		Av. velocity of wind, miles per hour by anemometer.	Atmospheric pressure, inches. Reduced to 32° F.			
Months in order of greatest per cent of weekly reports stating presence of.	Per cent of weekly reports stating presence of.												Av. order of prevalence where present, †, ‡	Av. daily range by reg- istering thermometers.	Average of three daily observations.	Relative per cent of saturation.	Absolute — grains of vapor in a cu- bic foot of air.	Inhaled.	Exhaled in ex- cess of that inhaled.	Average per cent of cloudiness.	Day observation, 7 A. M. to 2 P. M.	Night observation, 9 P. M. to 7 A. M.	Range.		Average pressure.
		Monthly and for year.	Av. daily by 3 daily observa- tions, ##													
		More than av. per cent of bronchitis.	Dec.....	64	2.4	12.25	34.71	82	1.47	.92	10.76	77											4.14	4.43		12.2	1.174	.293	29.029
Nov.....	59		2.1	14.14	35.47	80	2.22	1.39	10.29	69	3.30	3.70	11.5	1.005	.305	29.072
Jan.....	58		2.1	13.87	25.65	81	1.46	.91	10.77	71	3.86	3.91	10.8	1.240	.368	29.026
April...	56		2.6	17.58	43.77	72	2.67	1.67	10.01	51	3.20	3.83	10.0	.835	.192	29.123
March...	54		2.5	16.93	36.78	78	2.33	1.46	10.22	57	4.04	4.21	10.3	.859	.232	29.149
Oct.....	52		2.6	14.60	50.12	80	3.75	2.34	9.34	71	3.60	4.12	10.2	.894	.211	29.088
Feb.....	51		2.5	14.31	24.47	81	1.53	.96	10.72	78	4.19	4.60	11.1	.832	.229	29.091
Less than av. per cent of bronchitis.	Av.	49	2.5	17.20	47.62	77	3.57	2.23	9.45	57	3.57	3.94	9.7	.878	.215	29.080
	May....	47	2.4	19.01	56.91	74	4.24	2.65	9.03	50	3.70	4.05	9.1	.687	.155	29.021
	Sept....	41	2.8	20.16	64.21	75	5.31	3.32	8.36	39	3.16	3.29	8.6	.991	.180	29.098
	Aug....	38	2.9	19.47	69.43	75	6.04	3.78	7.90	47	3.85	4.42	7.0	.493	.134	29.069
	June....	38	2.4	21.40	67.75	74	5.78	3.61	8.07	42	3.12	3.59	8.3	.931	.164	29.068
July....	33	2.6	22.65	72.14	68	6.05	3.78	7.90	29	2.65	3.15	7.3	.598	.116	29.127	

EXHIBIT VIII.—By year and months for 1898, and for the preceding year, and an average for the 21 years, 1877-97,* also for the 12 years, 1886-97, stating on what per cent of the weekly reports received. PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, NEURALGIA* AND TONSILLITIS,* were reported present; and comparing the per cents for months in 1898 with the averages for corresponding months in the years specified.

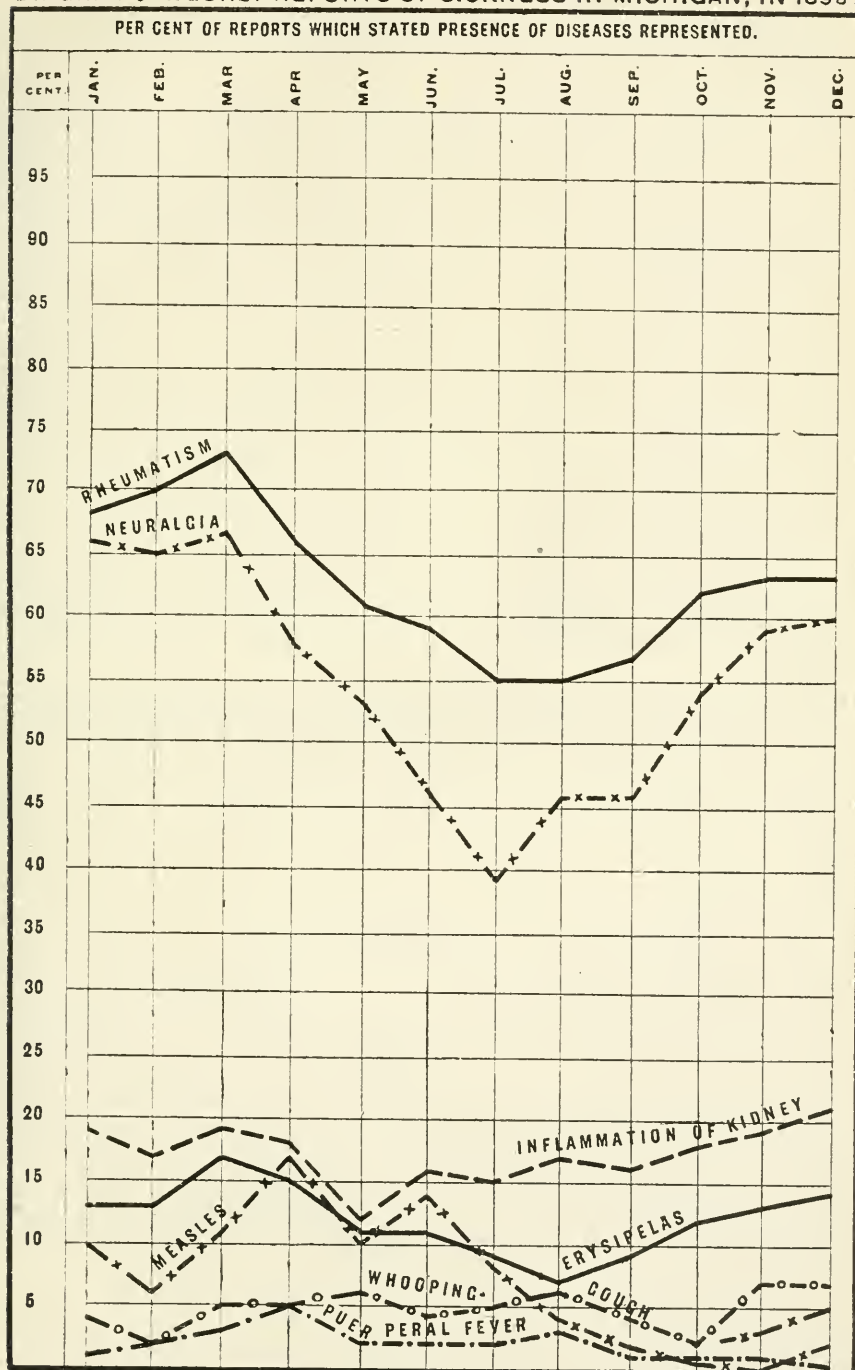
	Years, etc.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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*For neuralgia and tonsillitis an average for the 19 years, 1879-1897.

†This comparison is made because of change of plan of reports in May, 1885, as explained on page 59.

The lines for 1898 in Exhibit VIII, relative to the eight diseases, are graphically represented in Diagrams 1, 2, 3 and 4 of this article.

DIAGRAM 3—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1898.



[PLATE 1031]

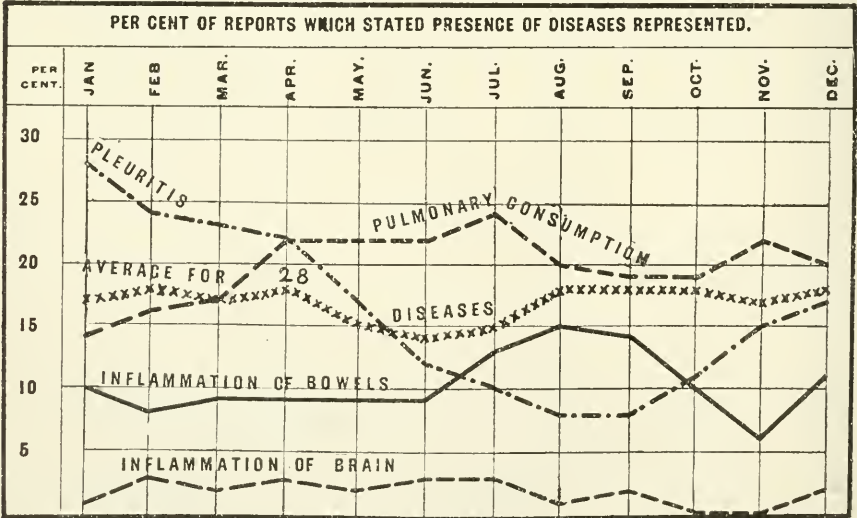
EXHIBIT IX.—SICKNESS FROM CONSUMPTION.—1895-98.—By year and months for each of the 24 years, 1895-98, and an average for the 20 years, 1878-97,* also for the 12 years, 1886-97; stating on what per cent of the weekly reports received CONSUMPTION was reported present, and comparing the per cents for 1898 with the averages for corresponding months in those years.

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 20 years, 1878-97*.....	51	52	53	54	56	52	51	49	48	49	49	49	49
Average 12 years, 1886-97.....	41	43	42	44	45	43	41	40	40	39	38	38	39
1895.....	29	33	31	33	34	29	30	29	28	25	25	24	24
1896.....	23	22	24	22	21	26	24	22	25	25	22	22	21
1897.....	20	22	20	23	21	22	22	23	22	18	16	14	13
1898.....	20	14	16	17	22	22	22	24	20	19	19	22	20
In 1898 less than av. 1878-97.....	31	38	37	37	34	30	29	25	28	30	30	27	29
In 1898 less than av. 1886-97†.....	21	29	26	27	23	21	19	16	20	20	19	16	19

*As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.

†This comparison is made because of change of plan of reports in May, 1885, as explained on page 59.

DIAGRAM 4—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1898.



*Relations of diarrhea and other "warm-weather" diseases to meteorological conditions.**

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, cholera morbus, dysentery, measles, or whooping-cough, the average daily temperature, the average daily range of temperature, the absolute humidity of the atmosphere, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea (or of the other diseases named), these conditions were **less** than the average for the year.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, cholera morbus, dysentery, measles, or whooping-cough, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, and the monthly and average daily range of the barometer were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of diarrhea (or of the other diseases named), these conditions were **greater** than the average for the year.

Explanations of propositions 1 and 2 are given on a preceding page, under the heading, "Climate and Sickness."

A summary relative to the foregoing propositions, is presented in Exhibit XII., near the close of this article.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 1, it is true, also, that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, whooping-cough, cholera morbus and dysentery; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea (and of the other diseases named) was **less** than the average.

On what per cent of the weekly reports received, by months in the years 1877-98, the ten foregoing diseases were reported present, is stated in Exhibit X.

The lines for 1898, relative to the ten diseases, are graphically represented in Diagrams 1, 3 and 5 in this article.

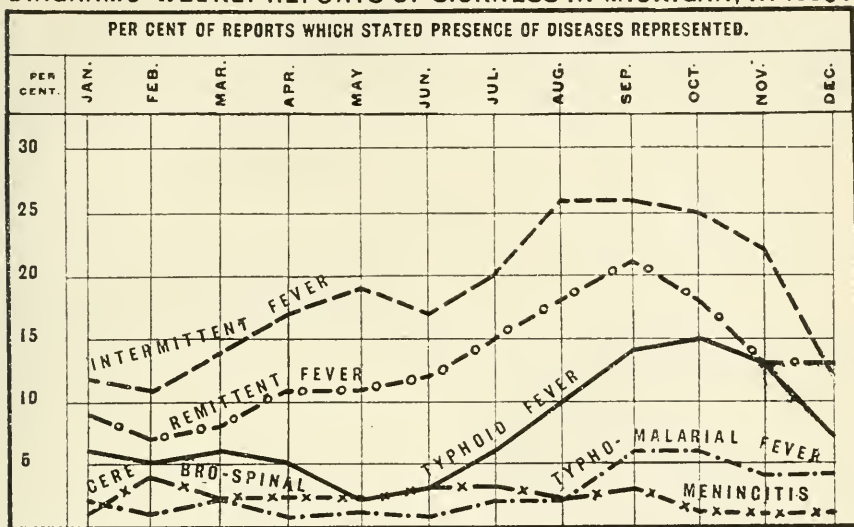
*A comparison of meteorological conditions in 1898, with the average for series of years, is given in Exhibit V., of this article.

EXHIBIT X.—By year and months, for 1898 and for the preceding year, and averages for the 21 years, 1877-97, also for the 12 years, 1886-97,—stating on what per cent of the weekly reports received DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES, WHOOPING-COUGH, CHOLERA MORBUS AND DYSENTERY were reported present, and comparing the per cents for 1898, with the averages for corresponding months in the years specified.

Years, etc.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.													Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 21 years, 1877-1897	44	26	27	28	30	33	41	37	81	76	53	33	26	Cholera infantum.	12	2	1	2	2	2	3	9	27	42	33	12	3	2										
	Av. 12 years, 1886-1897	42	26	26	27	28	30	33	31	76	72	51	30	25			11	1	1	1	2	3	6	24	38	32	11	3	2										
	1897	34	14	19	19	20	24	27	46	63	66	58	34	23			8	0	0.3	0.2	0.3	3	5	16	22	27	17	2	0.3										
	1898	36	22	22	20	17	20	29	48	65	67	49	28	22			8	10.5	0.7	1	1	3	6	18	28	26	12	0.6	0.3										
	In 1898 greater than av. 1877-1897	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1877-1897	8	4	5	8	13	13	12	19	16	9	4	5	1			4	1	0.5	1.3	1	2	3	9	14	7	—	2.4	1.7										
	In 1898 greater than av. 1886-1897*	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1886-97*	6	4	4	7	11	10	9	13	11	5	2	2	—			3	—	0.5	0.3	—	2	2	6	10	6	—	2.4	1.7										
	Intermittent fever.	Av. 21 years, 1877-1897	51	41	42	44	51	54	56	58	58	58	56	49			42	Remittent fever.	35	29	28	29	32	33	35	37	42	45	43	36	31								
		Av. 12 years, 1886-1897	33	27	27	29	34	34	35	38	39	38	36	32			27			24	21	20	20	21	22	23	25	29	31	30	25	22							
1897		17	12	12	10	14	13	18	17	24	28	24	19	13	11	10	9			9	11	11	13	16	15	16	13	10	5										
1898		19	12	11	14	17	19	17	20	26	26	23	29	12	13	9	7			8	11	11	12	15	18	21	18	13	13										
In 1898 greater than av. 1877-1897		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—									
In 1898 less than av. 1877-97		32	29	31	30	34	35	39	38	32	32	31	27	30	22	20	21			21	21	22	23	22	24	24	25	23	18										
In 1898 greater than av. 1886-1897*		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—									
In 1898 less than av. 1886-97*		14	15	16	15	17	15	18	18	13	12	11	10	15	11	12	13			12	10	11	11	10	11	10	12	12	9										
Typhoid fever.		Av. 21 years, 1877-1897	11	9	7	5	4	4	5	7	13	19	21	18	12	Typho-malarial fever.	14			11	9	9	8	8	8	10	17	26	28	20	14								
		Av. 12 years, 1886-1897	10	7	5	4	3	4	5	7	14	19	20	17	10					8	5	5	5	5	4	4	6	11	15	16	10	6							
	1897	7	3	5	3	0	9	3	5	4	12	10	14	12	0.9			0	0.3	0.7	0.3	0.9	0.7	2	4	2	0	0.8											
	1898	8	6	5	6	5	2	3	6	10	14	15	13	11	2			2	0.8	2	0.6	1	1.5	2	2	6	6	4	4										
	In 1898 greater than av. 1877-1897	—	—	—	1	1	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1877-97	3	3	2	—	—	2	2	1	3	5	6	5	5	12			9	8.2	7	7.4	7	7.5	8	15	20	22	16	10										
	In 1898 greater than av. 1886-1897*	—	—	—	2	2	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1886-97*	2	1	—	—	—	2	2	1	4	5	5	4	3	6			3	4.2	3	4.4	3	3.5	4	9	10	6	2	—										
	Measles.	Av. 21 years, 1877-1897	11	9	12	15	19	22	19	11	5	4	3	5	6			Whooping-cough.	15	14	15	14	14	15	15	17	17	15	13	13	13								
		Av. 12 years, 1886-1897	9	7	11	13	16	19	16	9	4	2	3	4	5					11	10	10	10	11	12	11	13	13	11	9	9	9							
1897		13	8	12	17	24	32	25	12	8	4	3	7	5	4	3	2			2	3	5	4	9	8	5	4	5	3										
1898		7	10	6	11	17	10	14	8	4	2	0.5	0	0	5	4	2			5	5	6	4	5	6	4	2	1	7										
In 1898 greater than av. 1877-1897		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—									
In 1898 less than av. 1877-97		4	—	6	4	2	12	5	3	1	2	2.5	5	4	10	10	13			9	9	9	11	12	11	11	11	6	6										
In 1898 greater than av. 1886-1897*		—	3	—	—	1	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—									
In 1898 less than av. 1886-97*		2	—	5	2	—	9	2	1	—	—	2.5	4	3	6	6	8			5	6	6	7	8	7	7	7	2	2										
Cholera morbus.		Av. 21 years, 1877-1897	16	3	4	4	5	7	16	39	50	37	14	6	4	Dysentery.	17			6	6	7	7	8	11	26	47	43	23	10	6								
		Av. 12 years, 1886-1897	15	3	3	3	4	7	14	33	45	35	13	5	4					15	6	6	6	6	7	10	22	41	39	21	9	6							
	1897	10	1	3	3	4	3	6	20	27	28	21	5	1	12			4	4	6	4	6	6	16	24	30	29	9	7										
	1898	12	2	2	2	2	4	8	22	36	31	16	3	—	12			4	3	6	2	2	6	16	33	32	21	5	3										
	In 1898 greater than av. 1877-1897	—	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1877-97	4	1	2	2	—	3	3	8	17	14	6	—	3	5			2	3	1	5	6	5	10	14	11	2	5	3										
	In 1898 greater than av. 1886-1897*	—	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1898 less than av. 1886-97*	3	1	1	1	2	3	6	11	9	4	—	2	2	3			2	3	—	4	5	4	6	8	7	—	4	3										

*This comparison is made because of change of plan of reports in May, 1885, as explained on page 59.

DIAGRAM 5—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1898.



[PLATE 1033]

Total sickness—average disease.

"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is shown on the third page of this article. Twenty-eight diseases are printed on the cards. In 1898 there were 5,219 of these card reports received. On some of the cards only one or two diseases were reported present and on others more. Had each disease (printed on this card, and only the twenty-eight thus named) been reported present on every card received at this office, there would have been 146,132 reports of diseases present. (This is the product of 5,219 reports received multiplied by twenty-eight, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 24,496 disease reports, which $24,496 \div 146,132$ of the possible disease reports that might have been present, is about 17 per cent. This 17 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." This is shown, by months in Diagram 4, on a preceding page.

Exhibit XIII. serves to indicate the probable actual sickness in the State from the tabulated diseases in 1897-98. It compares the sickness in 1898 by months with the sickness by months in each of the twenty-one years, 1877-1897. It also compares the sickness by months in 1898, with the sickness, by months, in each of the twelve years, 1886-1897.

By Exhibit XIII., it will be seen that the sickness reported in 1898, was, for the year, and for each month of the year, considerably less than

COLD-WEATHER DISEASES.

EXHIBIT XI.—*Summary relative to propositions on preceding pages and in Exhibit X., concerning relations by months, in 1898, between greater or less than usual prevalence of diseases named, and certain given coincident climatic conditions.*

Diseases.	Months (inclusive) in which diseases named were more than usually prevalent in 1898.	Months (inclusive) in which diseases named were less than usually prevalent in 1898.	For the 12 months of the year 1898. Number of months in which propositions hold true.*											
			That in months when diseases named were more than usually prevalent the conditions named below were greater than usual, and in months when less than usually prevalent these condi- tions were less than usual.†								That in mos. when diseases named were more than usually preva- lent the condi- tions named be- low were lower than usual, and in months when the diseases were less than usually prevalent these conditions were higher than usual.‡			
			Relative humidity.	Av. per cent of cloudiness.		Ozone.		Velocity of wind.	Atmos- pheric pressure.		Average temperature.	Av. daily range of temp.†	Av. daily atmospheric pres- sure.‡	Absolute humidity.
			Day.	Night.		Monthly.	Av. daily.							
Bronchitis	Jan.-Apr., Oct.- Dec.	May-Sept.....	11	11	8	7	12	7	10	11	11	5	11	
Pneumonia.....	Jan., May, Dec.	June-Nov.....	8	8	9	8	9	4	9	8	10	6	10	
Membran. croup...	Jan.-Apr., Oct.	May-Sep.,Nov., Dec.	9	9	8	7	10	5	8	9	9	3	9	
Diphtheria.....	Jan.-Apr.,June, Oct.-Dec.	May, July-Sept.	10	10	7	6	11	8	9	10	10	6	10	
Tonsillitis	Jan.-Apr., Oct.- Dec.	May-Sept.....	11	11	8	7	12	7	10	11	11	5	11	
Influenza.....	Jan.-May, Nov., Dec.	June-Oct.....	9	9	8	7	10	5	10	9	11	7	11	
Scarlet fever.....	Jan., Feb., Apr., May, July, Oct.-Dec.	Mar.,June,Aug., Sept.	8	9	7	6	9	6	7	8	8	6	8	
Rheumatism.....	Jan.-Apr., Oct.- Dec.	May-Sept.....	11	11	8	7	12	7	10	11	11	5	11	
Neuralgia.....	Jan.-Apr., Oct.- Dec.	May-Sept.....	11	11	8	7	12	7	10	11	11	5	11	
Consumption, pul..	Apr.-Aug.,Nov., Dec.	Jan.-Mar.,Sept., Oct.	3	4	4	5	4	5	4	3	5	9	5	
Pleuritis.....	Jan.-May, Nov., Dec.	June-Oct.....	9	9	8	7	10	5	10	9	11	7	11	
Average disease...	Jan.-Apr., Oct.- Dec.	May-July.....	9	9	8	7	10	7	8	9	9	5	9	

*The figures in each of these eleven columns show for how many months out of the twelve months in 1898, the proposition named over the column holds true; thus, concerning bronchitis, the proposition relative to average daily range of temperature held true in eleven months out of the twelve; that relative to average temperature, in eleven out of twelve, etc.

†The statements relative to the average daily range of temperature and the average daily pressure of the atmosphere were taken from proposition 1 and inserted in proposition 2 in the statistical study of sickness in Michigan in 1893, annual report for 1894. These propositions are printed on preceding pages of this report, under the heading "Climate and Sickness."

the average reported for the twenty-one years, 1877-1897, and less than the average for the twelve years, 1886-1897.

On this subject Exhibits A and B, on preceding pages, and the accompanying remarks, may be studied in connection with the exhibits and remarks in this part of this article. In Exhibit A, the order of prevalence of each disease, including the "average disease," is shown as it appears after taking account of the order or prevalence of each disease in the places where it was present, and also the per cent of all reports received on which that disease was reported.

WARM-WEATHER DISEASES.

EXHIBIT XII.—*Summary relative to propositions on preceding pages concerning relations, by months in 1898, between greater or less than usual prevalence of diseases named, and certain given coincident climatic conditions.*

Diseases.	Months (inclusive) in which diseases named were more than usually prevalent in 1898.	Months (inclusive) in which diseases named were less than usually prevalent in 1898.	For the 12 months of the year 1898. Number of months in which propositions hold true.*											
			That in months when diseases named were more prevalent than usual, the condi- tions named be- low were higher than usual; and in months when the diseases were less prevalent than usual, these conditions were lower than usual.						That in months when diseases named were more prevalent than usual, the conditions named below were less than usual; and in months when the diseases were less prevalent than usual, these conditions were greater than usual.					
			Average temperature.	Av. daily range of temp.	Absolute humidity.	Av. daily atmospheric pres- sure.	Atmos- pheric pressure.		Relative humidity.	Av. per cent of cloudiness.	Ozone.		Velocity of wind.	
							Range.				Day.	Night.		
							Monthly.	Av. daily.						
Diarrhea.....	July-Oct.....	Jan.-June, Nov., Dec.	8	10	10	8	6	9	8	8	7	6	9	
Cholera infantum..	July-Oct.....	Jan.-June, Nov., Dec.	8	10	10	8	6	9	8	8	7	6	9	
Intermittent fever.	May, July-Nov.	Jan.-Apr., June, Dec.	8	10	10	6	6	9	8	8	7	6	9	
Remittent fever...	July-Dec.....	Jan.-June.....	6	8	8	6	4	7	6	6	7	6	7	
Typhoid fever. (ent.)	Aug.-Nov.....	Jan.-July, Dec..	6	8	8	6	4	7	6	6	7	6	6	
Typho-mal. fever..	Jan.-Mar., July -Dec.....	Feb., Apr.-June.	4	6	6	6	4	5	4	7	5	6	5	
Measles.....	Jan., Mar-July.	Feb., Aug.-Dec.,	8	6	6	6	8	7	8	9	7	8	7	
Whooping-cough..	Mar.-May, July, Aug., Nov., Dec.	Jan., Feb., June, Sept., Oct.....	7	5	5	5	9	6	7	8	6	5	6	
Cholera morbus....	July-Oct.....	Jan.-June, Nov., Dec.	8	10	10	8	6	9	8	8	7	6	9	
Dysentery.....	July-Oct.....	Jan.-June, Nov., Dec.	8	10	10	8	6	9	8	8	7	6	9	

*The figures in each of these eleven columns show for how many months out of the twelve months in 1898 the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to average daily range of temperature held true in ten months out of the twelve; that relative to absolute humidity ten months out of the twelve, etc.

EXHIBIT XIII.—SICKNESS FROM AVERAGE DISEASE, 1897-98.—*By year and months for each of the years, 1897-98, stating on an average for such of the 28 diseases tabulated as were reported present, what per cent of the weekly reports received stated presence of the diseases; and comparing the average per cents for months in 1898 with the averages for corresponding months in the 21 years, 1877-97, and in the 12 years, 1886-97.**

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 21 years, 1877-97.....	26	26	27	27	26	24	23	25	27	28	26	25	25
Average 12 years, 1886-97.....	22	23	22	24	23	22	20	21	23	23	22	21	22
1897.....	18	18	18	19	18	17	16	17	18	19	19	17	16
1898.....	17	17	18	17	18	15	14	15	18	18	18	17	18
In 1898 less than average 1877-1897.....	9	9	9	10	8	9	9	10	9	10	8	8	7
In 1898 less than average 1886-97*.....	5	6	4	7	5	7	6	6	5	5	4	4	4

*This last comparison is made because of the change in the plan of making the reports, which occurred in May, 1885, as explained on page 59.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1898.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE
BOARD OF HEALTH.

This paper continues a subject treated for the preceding year on pages 150-350 of the Report of the State Board of Health for the year 1897, and for former years in previous reports.

Whenever information is received at this office of the outbreak (in any locality in Michigan) of diphtheria, scarlet fever, typhoid fever, consumption, smallpox, measles, German measles (rötheln), whooping-cough, rabies or glanders, a letter is sent to the health officer of the township, city or village in which the disease is reported to be present (if the name of the health officer has been reported to this office; if not, to the president of the board of health), calling his attention (if the report was not received from him) to the reported existence of the disease within his territory, indicating his duties and powers and the proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among the neighbors of families in which the disease is present,* and asking for a report of the methods employed for the restriction of the disease, and the results of efforts for suppressing it, also the number of cases and deaths in each outbreak. In the case of typhoid fever, a printed letter was used (form [162.]) which is reproduced in Part I. of the report of this Board for 1894, p. lxxxvi. In the case of diphtheria, scarlet fever, and smallpox the letter generally sent during the year 1894 was substantially the same as that printed on pages 251-252 of the Report of the State Board of Health for the year 1884, except that about a dozen questions were added, and in the case of measles a slightly modified form of the same letter was used. With this letter in each instance, there was sent a blank form (L) for the notice of the first case of a dangerous communicable disease, and a blank form (M) for weekly reports during the continuance

*It is believed that these documents distributed in this manner are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus led to co-operate in stamping out the disease. Some evidence of the value of this work may be seen further on, in the several articles to which this is an introduction, in tables which show the estimated number of outbreaks of, and cases of sickness from communicable diseases prevented, and lives saved by isolation and disinfection.

In the report of this Board for the year 1895 (pp. 153-174) in the introduction to the articles on the dangerous communicable diseases, are printed tables and diagrams which show the results of restrictive measures recommended by this Board.

TABLE 1.—*Number of all places* in Michigan at which communicable diseases were reported present, also the number of new places† at which each disease was reported present each week in 1898.*

Weeks ending Saturday—	Diphtheria.		Scarlet fever.		Typhoid fever.		Measles.		Whooping- cough.		Consump- tion.		Small- pox.	
	*Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.
January.....	8..	38	12	38	10	35	11	34	8	15	4	150	23	0 0
	15..	41	15	38	6	35	13	38	13	17	10	125	21	0 0
	22..	37	11	30	10	31	4	41	11	19	5	100	4	0 0
	29..	33	10	29	3	29	4	37	8	13	3	100	10	0 0
February.....	5..	26	13	34	6	20	2	41	12	8	0	100	6	0 0
	12..	26	7	36	14	24	7	44	8	8	1	88	10	0 0
	19..	26	14	37	11	28	8	47	6	12	3	107	14	1 1
	26..	34	6	39	8	33	10	58	11	17	5	1	16	1 0
March.....	5..	31	11	36	10	37	9	49	14	13	4	124	15	1 0
	12..	27	7	33	9	31	8	46	9	11	3	127	5	1 0
	19..	21	7	26	10	25	4	55	13	10	2	131	15	1 0
	26..	17	3	27	4	25	13	55	18	12	2	133	18	1 0
April.....	2..	19	6	26	6	18	3	50	10	7	3	137	8	1 1
	9..	22	6	26	7	23	4	55	12	8	3	136	1	1 0
	16..	18	9	23	8	21	5	60	9	8	1	137	5	1 0
	23..	23	8	28	8	22	5	62	16	12	2	140	8	1 0
May.....	30..	18	4	30	8	18	7	67	14	12	5	147	8	0 0
	7..	18	6	35	9	15	3	64	21	14	2	151	11	0 0
	14..	20	8	34	9	23	6	56	11	19	5	157	3	0 0
	21..	17	1	31	10	26	9	59	20	15	6	159	11	0 0
June.....	28..	15	4	20	4	24	10	52	14	19	6	164	5	0 0
	4..	18	6	23	6	19	2	59	21	24	8	166	10	0 0
	11..	26	8	23	8	19	4	52	6	19	2	168	3	0 0
	18..	27	9	19	2	20	7	59	11	18	1	174	3	0 0
July.....	25..	21	7	22	5	18	3	50	12	18	1	172	11	0 0
	2..	14	7	16	8	12	5	32	11	11	5	178	7	0 0
	9..	23	10	19	3	16	5	42	10	10	1	178	9	0 0
	16..	17	2	14	1	18	4	35	12	14	3	177	1	1 1
August.....	23..	17	8	22	10	25	6	34	5	19	6	177	10	1 0
	30..	13	2	25	9	34	6	26	7	18	4	180	7	1 0
	6..	15	8	18	2	42	17	29	3	15	2	181	5	1 0
	13..	14	4	16	5	46	9	26	6	19	1	182	4	1 0
September.....	20..	19	5	16	5	62	21	19	5	18	6	182	4	0 0
	27..	19	6	17	5	58	28	14	4	14	6	187	6	1 0
	3..	17	11	17	5	62	14	12	5	13	2	190	7	0 0
	10..	13	3	23	7	83	20	7	0	19	4	189	7	1 0
October.....	17..	16	1	21	5	89	32	7	0	21	2	190	2	1 2
	24..	17	10	25	10	111	24	6	6	20	6	186	4	1 0
	1..	22	6	29	4	102	27	7	2	11	1	181	6	1 0
	8..	28	14	24	8	90	20	4	2	13	1	182	6	1 0
November.....	15..	30	9	22	4	84	24	8	1	10	0	183	11	1 0
	22..	30	10	26	7	82	17	3	2	11	3	187	7	1 0
	29..	35	11	27	11	84	22	9	2	7	1	188	5	1 0
	5..	39	14	32	7	72	16	4	1	12	2	187	3	1 1
December.....	12..	36	12	36	7	72	9	3	2	15	4	146	0	1 0
	19..	39	12	43	13	71	16	7	2	13	2	148	2	2 0
	26..	35	14	40	10	64	18	5	2	18	3	126	3	2 1
	3..	30	3	35	11	54	9	10	1	14	2	128	8	2 0
Average number of places per week...	10..	32	9	45	11	50	12	12	4	13	0	130	6	2 0
	17..	27	9	41	12	41	4	15	6	14	2	131	6	1 0
	24..	19	4	44	10	46	10	20	4	15	1	133	2	1 0
	31..	19	9	43	11	43	4	15	4	18	3	142	4	1 0

*The number of "Places" are copied from the weekly bulletins "Health in Michigan" issued every Wednesday, and include all places at which the several diseases were reported present up to and including Saturday of the calendar week for which each bulletin is issued. "New places" are included in these numbers.

The numbers in the first column, "Places," are compiled from the data in card-reports for the sickness statistics, the outbreak reports of communicable diseases, and the weekly reports of communicable diseases.

†The "New places," are those from which the specified diseases were first reported during the calendar week specified in each bulletin. They are compiled from the same sources as are the numbers in the first column of this table and from newspaper reports. Neither of the columns of this table contain *all* the places at which, later, by the "final" and "annual" reports, the diseases were found to have been present.

of the disease. After the outbreak was over, there was sent a blank form (K) or (O) for special final report. Blanks (L) and (M) now in use are substantially the same as those printed on pages 253-254 of the report for 1884. The blank (K) for final report is printed on pages xiii-xiv of the report of this Board for 1888; but the present blank is more complete. The blank (O) is for typhoid fever, and was first used in September, 1890. Since that date it has been modified; as at present used it is printed on pages 149-150 of the report of this Board for 1895.

The information contained in the above-mentioned blanks and those supplied to health officers and clerks of townships, cities and villages, for their annual reports, when filled and returned to this office by the health officers of localities where dangerous communicable diseases have existed, together with other correspondence in regard to outbreaks of such diseases, are the bases on which the various statements made in this article are founded.

It is probable that every case of smallpox is reported to the Secretary of the State Board of Health; but that cannot yet be said of any other of the diseases in Table 1. Named in the order of most complete reports, probably these communicable diseases would be arranged as follows: Smallpox, scarlet fever, diphtheria, typhoid fever, measles, consumption.

Some of the purposes of this compilation.

The objects in having the data contained in the various reports received at the office of the secretary compiled, tabulated and published are: First, that facts relative to the ways whereby dangerous communicable diseases are spread in Michigan, and how they are sometimes restricted, and other useful facts, may be submitted to the people of the State, knowledge of which, it is hoped, will enable them to avoid or combat such diseases; and second, by the collation of such data to aid in the progress of sanitary science, especially in as far as it bears on the study of the cause and prevention of dangerous communicable diseases in Michigan.

Persistent efforts of this Board have been directed toward impressing the people of the State with the necessity of adopting restrictive measures,—isolation and disinfection, in outbreaks of communicable diseases.

Definition of the term "outbreak" as used in this article.

For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction), died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area.

DIPHTHERIA IN MICHIGAN—YEAR ENDING DECEMBER 31, 1898.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE
BOARD OF HEALTH.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health 439 outbreaks of diphtheria in 354 localities in Michigan, which resulted in 2,357 cases and 477 deaths.

The average numbers of cases of sickness and of deaths per outbreak were, cases 5.4, deaths 1.1. The fatality, i. e., the cases which proved fatal, was 20.2 per 100 cases.

In 1898 there were 1,115 cases and 279 deaths less reported diphtheria in Michigan than in 1897; and 1,537 cases and 387 deaths less than the average reported cases and deaths for the fourteen years 1884-1897.

Distribution of diphtheria by counties.

Table 1 exhibits the reported diphtheria by counties during the year 1898. Said table shows, in addition to the actual numbers of reported cases and deaths, the sickness and death-rates per 10,000 of population in each county; thus rendering the relative amount of sickness and death from this disease in the counties more readily conceivable.

Sickness-rates from diphtheria in 1898.

Table 1 shows that the sickness-rate for the whole State during the year was 9.66 per 10,000 of population. By counties the greatest sickness rate (147.50) was in Montmorency County; and the lowest (0.39), was in Branch County. In eleven counties there was no reported sickness from diphtheria.

Death-rates from diphtheria in 1898.

The death-rate for the State was 2.00 per 10,000 of population. The highest death-rate (26.96 per 10,000 of population), was in Montmorency County; and the lowest, where deaths occurred (.33 of one death per 10,000 of population), was in Hillsdale County. From twenty counties there were no reported deaths.

The proportionate case-rate, death-rate and fatality or "case-mortality," in cities, villages and townships.

The proportionate fatality or "case-mortality" from diphtheria in 1898, i. e., the proportion of reported cases which proved fatal, was, for the whole State, 20.2 per cent, or one death to 4.9 cases.

From the data in Table 2 it may be observed that 66 per cent of the cities, 17 per cent of the villages, and 21 per cent of the townships in the State were infected with diphtheria. But the average population of the cities is fourteen times the average population of the villages. The low-

TABLE 1.—Numbers of cases and deaths reported from Diphtheria per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, clerks, etc.)

Counties.	Estimated population for 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population for 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	2,357	477	9.66	2.00	Keweenaw... Lake.....	2,851 5,289	1 4	0 1	2.51 7.56	0 1.89
Alcona.....	5,427	2	0	3.69	0	Lapeer.....	28,545	35	4	12.26	1.40
Alger.....	1,532	1	1	6.53	6.53	Leelanau....	10,967	12	4	10.94	3.65
Allegan.....	39,417	16	5	4.06	1.27	Lenawee.....	48,636	15	2	3.08	0.41
Alpena.....	19,853	50	11	25.19	5.54	Livingston...	20,016	2	1	1.00	0.50
Antrim.....	14,442	14	3	9.69	2.08	Luce.....	2,241	0	0	0	0
Arenac.....	8,203	21	6	25.60	7.31	Mackinac....	6,644	0	0	0	0
Baraga.....	5,428	0	0	0	0	Macomb.....	33,961	48	11	14.13	3.24
Barry.....	23,615	11	3	4.66	1.27	Manistee....	27,998	5	3	1.79	1.07
Bay.....	66,196	67	12	10.12	1.81	Marquette...	39,936	60	15	15.02	3.76
Benzie.....	10,889	1	1	0.92	0.92	Mason.....	20,459	5	4	2.44	1.96
Berrien.....	49,985	100	16	20.01	3.20	Mecosta.....	21,761	8	3	3.68	1.38
Branch.....	25,623	1	0	0.39	0	Menominee...	24,947	23	4	9.22	1.60
Calhoun.....	51,443	15	2	2.92	0.39	Midland.....	15,779	54	11	34.22	6.97
Cass.....	21,399	6	4	2.80	1.87	Missaukee....	8,862	0	0	0	0
Charlevoix...	12,322	2	0	1.62	0	Monroe.....	34,025	12	3	3.53	0.88
Cheboygan...	15,814	13	4	8.22	2.53	Montcalm....	35,679	47	5	13.17	1.40
Chippewa....	18,625	1	1	0.54	0.54	Montmorency	3,389	50	9	147.54	26.56
Clare.....	8,399	1	1	1.19	1.19	Muskegon....	34,635	85	15	24.54	4.33
Clinton.....	26,015	3	1	1.15	0.38	Newaygo.....	17,774	1	1	0.56	0.56
Crawford....	2,458	3	0	12.21	0	Oakland.....	44,107	53	5	12.02	1.13
Delta.....	23,194	3	0	1.29	0	Oceana.....	17,500	2	2	1.14	1.14
Dickinson...	15,448	32	3	20.71	1.94	Ogemaw.....	5,693	0	0	0	0
Eaton.....	33,142	19	2	5.73	0.60	Ontonagon...	9,990	0	0	0	0
Emmet.....	12,638	1	0	0.79	0	Osceola.....	18,320	19	7	10.37	3.82
Genesee.....	41,676	14	5	3.36	1.20	Oscoda.....	1,708	0	0	0	0
Gladwin.....	5,592	0	0	0	0	Otsego.....	5,316	8	1	15.05	1.88
Gogebie.....	15,000	68	17	45.33	11.33	Ottawa.....	42,508	77	20	17.99	4.67
Gd. Traverse.	21,675	4	1	1.85	0.46	Presque Isle..	7,135	10	3	14.02	4.20
Gratiot.....	28,884	27	4	9.35	1.38	Roscommon...	1,231	0	0	0	0
Hillsdale....	29,884	3	1	1.00	0.33	Saginaw.....	81,421	61	8	7.49	0.98
Houghton...	52,961	102	23	19.26	4.34	Sanilac.....	35,301	46	7	13.03	1.98
Huron.....	35,967	7	7	6.12	1.95	Schoolcraft..	8,436	0	0	0	0
Ingham.....	41,712	19	2	4.56	0.48	Shiawassee...	34,756	150	19	43.16	5.47
Ionia.....	36,839	34	5	9.23	1.36	St. Clair.....	56,537	23	8	4.07	1.42
Iosco.....	9,456	0	0	0	0	St. Joseph...	24,818	7	1	2.82	0.40
Iron.....	5,561	14	3	25.18	5.39	Tuscola.....	36,316	30	3	8.26	0.83
Isabella.....	24,094	11	2	4.57	0.83	Van Buren...	31,577	14	9	4.43	2.85
Jackson.....	48,039	39	7	8.12	1.46	Washtenaw...	44,808	20	2	4.46	0.45
Kalamazoo...	44,839	43	2	9.59	0.45	Wayne.....	327,808	527	116	16.08	3.50
Kalkaska....	6,120	4	0	6.54	0	Wexford.....	16,816	2	0	1.19	0
Kent.....	133,954	54	15	4.03	1.12						

*Population estimated by average annual increase, arithmetical method, based on U. S. Census of 1890 and the State Census of 1894; computed in the office of the State Board of Health.

TABLE 2.—*Exhibiting the numbers of outbreaks and cases of and deaths from Diphtheria which occurred in the cities, villages, and townships of Michigan in 1898, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages, and townships. (Compiled from reports of local health officials to the Secretary of the State Board of Health.)*

Classes of political divisions and numbers of each class of divisions.	Popula- tion.*	Health jurisdictions.	Outbreaks in:			Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Rates per 10,000 population				
			Localities.		No. of				Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Cases.	Deaths.
			No. of	Per cent of all local- ities.									
State (83 counties).....	2,389,393	1,582	354	22	439	2,357	477	20	9.66	2.00			
Cities.....	930,834	76	50	66	73	1,176	221	19	12.63	2.37			
Villages.....	256,485	300	52	17	63	171	32	19	6.67	1.25			
Townships.....	1,202,074	1,206	252	21	303	1,010	224	22	8.40	1.86			

* Estimated by arithmetical method in the office of the State Board of Health.

est case-rate (6.67) and death-rate (1.25) occurred in the villages; the highest case-rate (12.63) and death-rate (2.37) occurred in the cities; being nearly twice as great as in the villages. The highest fatality (22 per cent) occurred in the townships, and the lowest (19 per cent) occurred in the cities and villages, which were both the same.

DIPHTHERIA IN EACH MONTH OF THE YEAR, 1898.

TABLE 3.—*Exhibiting the number of outbreaks of Diphtheria which were reported to have begun, to have ended, and the number which were present, in each month of the year 1898, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Outbreaks began..	47	28	21	32	24	29	20	25	32	50	35	26	369
Outbreaks ended..	39	32	36	29	24	28	27	21	25	30	42	57	390
Outbreaks present.	85	86	75	72	66	71	59	58	67	90	96	83	-----

The last line of figures in Table 3, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. There may be a time during the outbreak when no cases are present, but if the subsequent cases can be attributed to infection from the preceding ones, it is called one outbreak. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were eighty-eight more beginnings than endings of outbreaks reported during the year 1898.

TABLE 4.—*Exhibiting the number and per cent of localities from which the presence of Diphtheria was reported, and the number and per cent of cases of Diphtheria present in Michigan in each month during the year 1898. (Includes each case for which, the time during which it existed, was stated in the reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Localities, number.....	81	83	73	67	58	59	44	47	55	63	68	60
Per cent.....	22.9	23.4	20.6	18.9	16.4	16.7	12.4	13.3	15.5	17.8	19.2	16.9
Cases present, number....	339	249	178	182	168	184	108	116	176	405	373	273
Per cent.....	14.4	10.6	7.6	7.7	7.1	7.8	4.6	4.9	7.5	17.2	15.8	11.6
Cases taken sick, number..	290	186	142	150	129	147	83	90	158	352	286	183
Per cent.....	12.3	7.9	6.0	6.4	5.5	6.2	3.5	3.8	6.7	14.9	12.1	7.8

The first line of Table 4 shows, for 1898, the number of localities in Michigan at which diphtheria was present in each month of the year. The second line shows the per cent those localities were of the total number of localities from which the disease was reported.

The third line of the table gives the numbers of cases sick in each month, and the fourth line the per cent those numbers were of the total reported cases.

The fifth line of the table gives the numbers of cases taken sick each month, and the per cent those numbers were of the total reported cases.

Source of contagium of diphtheria, and how the disease is spread.

Of the 2,357 cases of diphtheria reported, during the year 1898, the local health officers reported the source of contagium as follows: Traced to a former case, 480; probably traced to a former case, 9; traced to cases of "sore throat," etc., 1; due to infection from "clothing," etc., 8; attributed to unsanitary conditions, 12; from outside jurisdiction, 40; probably from outside jurisdiction, 10; unknown, 1,068; not reported or indefinitely reported, 729; total, 2,357.

Cases of diphtheria traced to preceding cases of the disease.

As shown above, 480 of the 2,357 reported cases of diphtheria in Michigan in 1898, were traced to preceding cases of the disease. Had all *first* cases in the various jurisdictions been properly isolated, no doubt a large part of these 480 cases would have been prevented.

In 1898, as in previous years, a number of cases of diphtheria were attributed to "unsanitary conditions." While such conditions may favor the spread of the disease and because of its assuming increased malignancy, the disease cannot be originated by those unsanitary conditions. The "germ," or contagious principle of the disease, must be present or the disease will not exist.

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TABLE 5.—*First, second and third localities, where the second locality was infected with Diphtheria from the first, and the third was infected from the second; and the numbers of cases and deaths from Diphtheria in the first, second and third localities with the dates of the beginning and ending of each outbreak. (Compiled from reports of health officers who were able to trace the source of contagium to other localities.)*

First localities from which Diphtheria was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Allegan county: Lee township..... (Aug. 10-Oct. 20.)	3	1	{ Allegan county: Casco township..... (Aug. 15-Sept. 1.) Ganges township..... (Sept.-Sept.)	2 3	1 0			
Alpena county: Alpena city..... (July, 1897-Aug. 1898.)	172	23	Presque Isle county: Posen township..... (Jan. 3-Jan. 16.)	10	3			
Barry county: Hope township..... (July 27-Aug. 16.)	3	1	Barry county: Barry township..... (Aug. 1-Aug. 22.)	1	0			
Bay county: Bay City..... (Jan. 14-Mar. 19.)	6	1	{ Cheboygan county: Nunda township..... (May-June 18.) Huron county: Caseville township.... (Oct. 22-Nov. 19.)	2 6	0 3			
Berrien county: Benton Harbor City.... (Jan. 1-Mar. 29.)	4	0	Allegan county: Casco township..... (Jan. 10-Feb. 5.)	2	0			
Berrien county: Benton Harbor City.... (Nov. 18-Dec. 15.)	5	1	Berrien county: St. Joseph city..... (Dec. 31-Mar. 14, 1899.)	2	1			
Berrien county: Galen village..... (1897-Oct. 8.)	65	5	Berrien county: Niles city..... (Feb. 3-Feb. 18.)	4	1			
Charlevoix county: Hayes township.....	*	---	Charlevoix county: Marion township..... (Nov. 28-Dec. 12.)	2	0			
Clinton county: Victor township.....	*	---	Clinton county: Ovid township..... (Jan. 2-Jan. 12.)	2	0			
Delta county: Nahma township.....	*	---	Iron county: Iron River village..... (Apr. 17-Apr. 22.)	1	1			
Dickinson county: Iron Mountain city..... (Jan. 1-May.)	14	1	Gogebic county: Bessemer township.... (Feb. 8-Feb. 20.)	1	1			
Dickinson county: Waucedah township.... (Nov. 5-Dec. 15.)	5	1	Dickinson county: Norway city..... (Nov. 7-Dec. 31.)	6	0			
Eaton county: Grand Ledge city..... (May —.)	2	0	Eaton county: Windsor township.... (June 13-July 16.)	2	0			
Genesee county: Argentine township....	*	---	Shiawassee county: Bennington township (June 17-July 11.)	2	1			
Genesee county: Montrose township....	*	---	Saginaw county: Albee township..... (Jan. 3-Jan. 16.)	1	0			

*Diphtheria was not reported to this office by the health officer of the "first" locality at the time it was said to have spread from there; showing that the disease, if present, was neglected; probably it was not reported to the health officer as the law requires.

TABLE 5.—CONTINUED.—*Movement of infection.*

First localities from which Diphtheria was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Houghton county: Calumet township. (Jan. 1*-Dec. 31.)	58	8	Marquette county: Marquette city..... (Sept. 25-Nov. 20.)	11	0			
			Jackson county: Summit township..... (May-July 18.)	7	1			
Jackson county: Jackson city..... (Jan. 1-Jan., 1899.)	25	4	Washtenaw county: Chelsea village..... (Apr. 5-May 16.)	1	0			
			Manchester township. (Jan. 4-Jan. 25.)	10	0			
			Northfield township.. (July 3-July 12.)	1	1			
Kalamazoo county: Kalamazoo city..... (Jan. 1-Dec. 31.)	31	1	Allegan county: Otsego village..... (Sept. 18-Sept. 26.)	1	1			
Kalamazoo county: Wakeshma township...	2	0	Kalamazoo county: Schoolcraft township (Sept. 22-Sept.)	1	0			
			Eaton county: Potterville village.... (Oct. 20-Nov. 27.)	4	1			
Kent county: Grand Rapids city..... (Jan. 1-Dec. 31.)	48	13	Mecosta county: Big Rapids city..... (Sept. 7-Sept. 20.)	1	0			
Lake county: Luther village..... (Oct. 22-Oct. 27.)	4	1	Osceola county: Lincoln township..... (Nov. 22-Dec. 30.)	10	5			
Lapeer county: Lapeer city..... (Jan. 1*-Apr. 22.)	3	2	Lapeer county: Marathon township... (June 14-July 7.)	13	0			
Macomb county: Romeo village..... (July-Jan. 10, 1899.)	2	0	Macomb county: Armada village..... (Aug. 6-Aug.)	1	0	St. Clair county: Grant township.	1	0
			Richmond village..... (Nov. 6-Dec. 21.)	9	3	Macomb county: Richmond township (Nov. 7-Dec. 20.)	6	2
Marquette county: Ishtepeming city..... (Jan. 1-Dec. 31.)	31	10	Marquette county: Champion township.. (July 15-July 29.)	1	0			
Mecosta county: Aetna township..... (Jan. 1*-Mar. 17.)	5	2	Mecosta county: Deerfield township.... (Feb. 25-Mar. 9.)	1	0			
Montcalm county: Richland township..... (July 8-Dec. 6.)	35	1	Gratiot county: New Haven township (Oct. 28-Nov. 30.)	3	2			
			Isabella county: Fremont township.... (Oct. 21-Nov. 26.)	4	0			
Montmorency county: Albert township..... (May 28-July 22.)	47	9	Crawford county: Grayling township.... (June 7-June 18.)	3	0			
Oakland county: Lyon township..... (Oct. 24-Nov. 2.)	3	1	Oakland county: Novi township..... (Oct. 29-Dec. 8.)	4	0			

* This outbreak is a continuation of one which began in 1897.

TABLE 5.—CONTINUED.—*Movement of infection.*

First localities from which Diphtheria was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Oakland county: Pontiac city..... (Jan. 1-Dec. 31.)	33	0	Oakland county: Pontiac township.... (Aug. 25-Sept. 5.)	1	0			
Ottawa county: Grand Haven city..... (May-Mar. 1899.)	44	11	Ottawa county: Spring Lake township (Sept. 17—)	1	0			
Saginaw county: Saginaw city..... (Jan. 1-Dec. 31.)	40	3	Saginaw county: Carrollton township.. (Sept. 15-Sept. 22)	1	1			
Shiawassee county: Owosso city..... (Jan. 1-Dec. 31.)	116	8	Montcalm county: Howard City..... (Dec. 25-Dec. 31.)	1	0			
			Shiawassee county: Hazelton township.... (July 27-Aug.)	1	0			
Shiawassee county: Rush township..... (Aug. 8-Dec. 10.)	5	0	Shiawassee county: New Haven township (Dec. 19-Dec. 27.)	2	0			
St. Clair county: Capac village.....	*	—	Lapeer county: Attica township..... (Nov. 27-Jan., 1899.)	7	1			
St. Clair county: Marine City..... (Sept. 20-Nov. 14.)	6	1	Midland county: Lincoln township..... (Nov. 12-Nov. 14.)	1	1			
St. Clair county: Port Huron city..... (June 26-Aug. 28.)	2	0	Lenawee county: Fairfield township.... (Sept. 25-Oct. 13.)	7	1			
Tuscola county: Almer township.....	1	0	Tuscola county: Fremont township....	2	0			
Tuscola county: Reese, Denmark Tp.....	*	—	Tuscola county: Fairgrove township.. (Feb. 1-Mar. 1.)	2	0			
Van Buren county: Bloomingdale township	*	—	Van Buren county: South Haven village.. (Jan. 9-Jan. 21.)	1	0			
			Washtenaw county: Ann Arbor city..... (Dec. 3-Dec. 22.)	3	0			
Wayne county: Dearborn township..... (Jan. 19-Feb. 1.)	1	0	Wayne county: Ecorse township..... (Jan. 26-Feb. 12.)	2	0			
Wayne county: Detroit city..... (Jan. 1-Dec. 31)	462	106	St. Clair county: Kimball township..... (Oct. 13-Oct. 15.)	1	1			
			Wayne county: Greenfield township.. (Aug. 1-Dec. 3.)	7	1			
Wexford county: Liberty township.....	*	—	Wexford county: Cedar Creek Tp..... (Oct. 10-Oct. 18.)	1	0			

* This foot-note is printed at the bottom of the first page.

TABLE 5.—CONTINUED.—*Movement of Infection of Diphtheria into Michigan from outside the State.*

First localities from which Diphtheria was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Chicago.....			Allegan county: Ganges township..... (Mar. 8-Mar. 20.)	1	0			
			Berrien county: Coloma village..... (June 22.-July 2.)	3	0			
			Hagar township.....	6	2			
			Calhoun county: Eckford township..... (Feb. 17-Mar.)	1	0			
			Emmet county: Petoskey city..... (Oct. 6-Oct. 20)	1	0			
			Van Buren county: South Haven Tp..... (Aug. 26-Sept. 10.)	1	0			
Dakota.....			Washtenaw county: Lodi township..... (Sept. 23-Oct. 15.)	1	0			
Illinois: Rockford.....			Iron county: Crystal Falls..... (Oct. 1-Oct. 29.)	5	1			
Ohio.....			Lenawee county: Palmyra township..... (Nov. 17-Dec. 3.)	1	1			
Ohio.....			Wayne county: Dearborn village..... (Jan. 19-Feb. 1.)	1	0			
Probable movement of infection of Diphtheria.								
Alpena county: Alpena city..... (1897-Aug.)	172	23	Alpena county: Wilson township..... (Jan. 5-Jan. 26.)	10	0			
Berrien county: Gallen village..... (1897-Oct. 8.)	65	5	Berrien county: Bertrand township..... (Apr. 27-May 7.)	1	0			
Branch county: Coldwatertownship....	*		Huron county: Rubicon township.... (Apr. 9—)	5	2			
Eaton county: Pottersville village..... (Oct. 20-Nov. 27.)	4	1	Eaton county: Charlotte city..... (Nov. 20 Jan. 10, 1899)	4	0			
Ionia county: Belding city.....	1	0	Ionia county: Ronald township.....	25	3			
Jackson county: Jackson city..... (Jan. 1-Jan. 1899.)	25	4	Jackson county: Spring Arbor Tp..... (Sept. 24-Nov. 29.)	2	0			
Lapeer county: Lapeer city.....	3	2	Genesee county: Burton township.....	1	1			

* This foot-note is printed at the bottom of the first page.

TABLE 5.—CONCLUDED.—**Probable movement of infection of Diphtheria.**

First localities from which Diphtheria was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Leelanau county: Elmwood township..... (Aug. 20-Oct. 12.)	5	1	Leelanau county: Solon township..... (Dec. 19-Dec. 24.)	1	0			
Shiawassee county: Bennington township.. (Jan. 17-Jan. 31.)	2	2	Shiawassee county: Sciota township..... (Feb. 25-Mar. 5.)	1	0			
Shiawassee county: Owosso city..... (Jan. 1-Dec. 31.)	116	8	Shiawassee county: Owosso township..... (Dec. 23-Dec. 29.)	1	0			
St. Joseph county: Three Rivers city.....	1	0	St. Joseph county: Nottawa township....	4	0			
Probable movement of infection of Diphtheria into Michigan from outside the State.								
Ontario: Toronto.....			Chippewa county: Sault Ste. Marie city. (Oct. 26-Oct. 29.)	1	1			

Table 5, shows the reported source of contagium in outbreaks of diphtheria and the places to which the infection spread from those outbreaks.

Estimated number of outbreaks and cases of diphtheria prevented and lives saved by isolation and disinfection.

Tables 6 and 7 and the following diagram compare the average numbers of cases and deaths in outbreaks of diphtheria where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where these measures were neglected.* By Table 6 it may be seen that during the twelve years, 1887-98, there were nearly six times as many cases and deaths per outbreak in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 7 it may be seen that during the year 1898 there were reported to the office of the State Board of Health 399 outbreaks of diphtheria, with 1,535 cases and 308 deaths. Had no efforts at restriction been made, and had the average numbers of cases and deaths per

*In the compilation of the reports for Tables 10 and 11 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

TABLE 6.—DIPHTHERIA IN MICHIGAN, 1887-98: Exhibiting for the 12 years 1887-98, the numbers of reported outbreaks, cases and deaths; also for this 12 year period, the average number of cases and deaths per outbreak in all outbreaks; in those outbreaks in which isolation or disinfection was doubtful; in which both isolation and disinfection were neglected; in which both isolation and disinfection were enforced; and also the numbers of cases and deaths indicated to have been prevented by isolation and disinfection.

Years.	All outbreaks.*			Isolation and disinfection, or both, not mentioned, or statements doubtful.			Isolation and disinfection both neglected.			Isolation and disinfection both enforced.		Indicated saving of cases and lives by isolation and disinfection.	
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Deaths.
1887.....	398	2,321	561	202	732	190	60	822	195	78	198	51	+ 733
1888.....	311	1,529	324	199	810	189	34	527	81	58	101	31	3,292
1889.....	376	1,986	418	254	1,314	280	41	478	108	63	98	14	2,398
1890.....	439	2,713	619	291	1,649	401	71	902	169	46	70	15	2,862
1891.....	582	2,965	643	366	1,777	389	79	944	194	70	157	33	3,392
1892.....	525	3,485	740	323	2,341	456	52	657	147	49	105	24	3,146
1893.....	526	3,133	746	303	1,681	362	74	1,020	282	65	159	45	4,253
1894.....	420	2,262	404	202	986	174	56	738	122	81	176	37	3,274
1895.....	388	2,292	435	178	1,102	209	45	610	119	70	146	28	2,969
1896.....	405	2,400	432	153	925	165	64	734	142	69	164	27	2,566
1897.....	464	2,838	497	165	916	137	100	1,365	252	93	225	46	3,500
1898.....	399	1,535	308	127	516	114	79	539	103	77	149	28	1,186
Totals for the 12 years, 1887-98.....	5,103	29,519	6,117	2,763	14,749	3,066	755	9,397	1,914	819	1,748	379	{ 235,970 + 35,160 7,073 }
Average for the 12 years, 1887-98.....	433	2,460	510	230	1,229	256	63	783	160	68	146	32	2,998
Average cases and deaths per outbreak for the 12 years, 1887-98.....	-----	5.68	1.18	-----	5.34	1.11	-----	12.43	2.54	-----	2.15	.47	-----

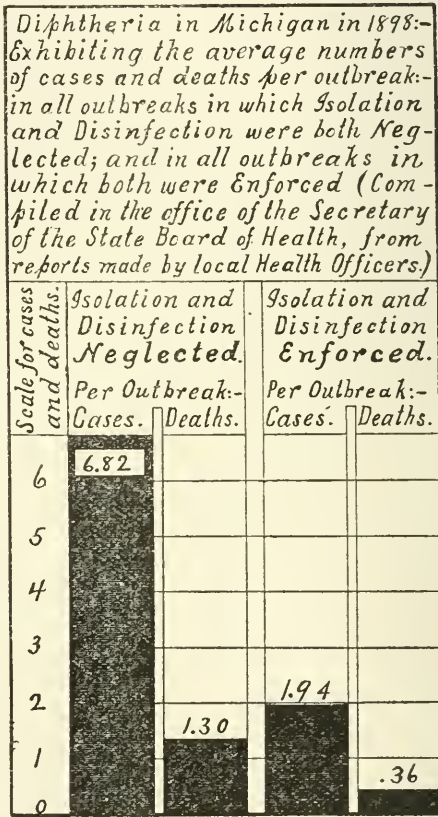
* These do not include the cases and deaths in a number of the latter cities (foot-note to Table 5), because of the difficulty in determining the beginning and ending of an outbreak in those cities, in which the disease was present in some part of the city nearly all the year. + The numbers of cases and deaths in this double column are found by multiplying "All outbreaks" for each year by the average number of cases or deaths per outbreak in those outbreaks in which "Isolation and disinfection both were neglected," for that year, and deducting from the result thus obtained the cases or deaths, as the case may be, which were reported to have occurred that year. + The two sets of numbers appearing in this column are based on a distinct method of solution which are explained as follows: (1) the 35,970 cases and 7,314 deaths are totals of the columns representing cases and death saved as explained in the foot-note; (2) the 35,030 cases and 7,073 deaths are obtained by multiplying the average numbers of cases and deaths per outbreak for the twelve years, 1887-98 (12.43 and 2.54 where isolation and disinfection were neglected), by the total number of outbreaks to find the numbers which would have occurred if all outbreaks had been neglected and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the twelve-year period.

TABLE 7.—DIPHTHERIA IN MICHIGAN IN 1898: Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 399 outbreaks reported; (2) in the 127 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 21 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 35 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 32 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 28 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 79 outbreaks in which isolation and disinfection were both neglected; (8) in the 77 outbreaks in which isolation and disinfection were both enforced.

	(1) All outbreaks. (399 outbreaks.)*		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (127 outbreaks.)*		(3) Disinfection enforced— isolation doubtful. (21 outbreaks.)		(4) Isolation enforced— disinfection doubtful. (35 outbreaks.)		(5) Disinfection enforced— isolation neglected. (32 outbreaks.)		(6) Isolation enforced— disinfection neglected. (28 outbreaks.)		(7) Isolation and disinfection both neglected. (79 outbreaks.)		(8) Isolation and disinfection both enforced. (77 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	1,535	308	516	114	73	17	77	9	120	30	61	7	539	103	149	28
Averages	3.85	0.77	4.06	0.90	3.48	0.81	2.20	0.26	3.75	0.94	2.18	0.25	46.82	1.30	1.94	0.36

* These do not include the cases and deaths in Detroit, Grand Rapids, Kalamazoo, Muskegon and Ishpeming because of the difficulty in determining the beginning and ending of an outbreak in these localities, in which the disease was present in some part of the locality nearly all the year.
† These figures are graphically represented in the diagram, Plate No. 1034, on this page.

ISOLATION AND DISINFECTION
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[PLATE 1034]

outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 2,721 cases and 519 deaths, and taking from these respectively the cases (1,535) and deaths (308) which did occur, leaves 1,186 cases and 211 deaths indicated as prevented in these 399 outbreaks, by isolation and disinfection. By the same method of computation for each year the indicated saving during the twelve years, 1887-98, is 35,970 cases and 7,314 lives.

Definition of Outbreak.—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the later cases are considered as part of the same outbreak. Possibly the sixty-day limit may at some future time be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of *years* require that outbreaks be counted as closed, at the end of the *year*; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks*, even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

Tables 6 and 7 and accompanying diagram (Plate No. 1034) show in 1898, as compared with 1897, and also with the twelve-year period, 1887-98, a slight decrease in the number of outbreaks, a very considerable decrease in the cases per outbreak, and a decrease in the deaths per outbreak; the decrease in cases being greatest in outbreaks where isolation and disinfection were both neglected.

These apparent decreases, which are probably real, are attributed principally to the following causes: (1) During 1898 better and more decisive reports were received from health officers, thus improving the accuracy of the classification of outbreaks with regard to isolation and disinfection, so that in 1898, only 32 per cent of the outbreaks were compiled in the "doubtful" column, whereas 36 per cent were so compiled in 1897, and an average of 54 per cent during the twelve-year period, 1887-98; in 1898 a corresponding increase appears in the "neglected" column, an average of but 14 per cent of the outbreaks being compiled there during the twelve year period, whereas 20 per cent were compiled there in 1898.

(2) It seems probable that, since it has come to be so generally known that diphtheria is certainly a communicable disease, many mild cases of diphtheria are now reported to the local health officer and by him to the State Board of Health office which were not previously so reported. To this is partly due the apparent relative decrease in the number of cases and deaths per outbreak. And this is especially true of so-called outbreaks in which isolation and disinfection were neglected. For instance, recently where there was a case of what was formerly called tonsillitis and the diagnosis was doubtful, the recommendation of the State Board of Health that the public health and safety be given the benefit of any doubt was adopted—the case was reported as an outbreak of diphtheria. Similar instances have tended to increase the number of reported outbreaks, and have decreased the average numbers of cases and deaths in the outbreaks; but such prompt and thorough action must tend to reduce the proportion of cases to outbreaks, consequently the chances of spread-

ing the disease. Therefore the total number of outbreaks is reduced, and the sickness and mortality from diphtheria lessened.

(3) Evidently antitoxin has lessened the number of *fatal* cases of this disease, there having been a marked reduction in case mortality since its introduction in 1894. The per cent of deaths to cases in the seven-year period, 1887-93, was 23.4; in the five-year period, 1894-98, it was 19.4—there being a decrease in the latter period as compared with the former period of about seventeen per cent in case mortality. The increased use of antitoxin in cases of diphtheria may have been a factor in the reduction of the number of cases per outbreak. The office of the State Board of Health has no evidence showing that antitoxin was very generally used as an immunizing agent. Hereafter an effort will be made to collect the data as to the proportion of outbreaks in which antitoxin is used as an immunizing agent.

It is not possible to determine just how much of the decrease referred to is due to each cause, nor is it possible to determine all the causes for all of that decrease, but an approximation is possible: Allowing the same number of cases in each outbreak during 1898 as the annual average during the twelve-year period, 1887-98, over one-fifth of the decrease of 925 in the number of cases of diphtheria during 1898 as compared with that period of years will be accounted for by reason of a less number of outbreaks in 1898, as appears by the following:

Average annual number of cases, 1887-98.....	2,460
Number of cases reported in 1898.....	1,535
Total cases,—decrease during 1898.....	925
Average annual number of outbreaks, 1887-98	433
Number of outbreaks, 1898.....	399
All outbreaks,—decrease during 1898.....	34
Average number of cases per outbreak, 1887-98.....	5.68
Equivalent to a decrease of cases during 1898 of $(34 \times 5.68 =)$	193

The decreased number of outbreaks may reasonably be attributed to the increased knowledge among the people generally that diphtheria is a dangerous communicable disease, and to the greater care being taken to restrict its spread. The very considerable decrease in the number of cases per outbreak is partly due to this same cause.

TABLE 8.—*Exhibiting the reported period of incubation, stated in days, in 115 cases of Diphtheria. Compiled from reports of health officers in Michigan, for the year 1898.*

Incubation period—days...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	21	28	31	36
Cases in each period.....	3	6	*14	+7	+7	§8	*18	11	‡4	**12	1	2	2	††8	3	2	‡‡1	1	1	1

* In 1 of these cases *about* 5 days.

+ In 2 of these cases *about* 4 days.

‡ In 1 of these cases *about* 5 days.

§ In 8 of these cases *about* 6 days.

* In 2 of these cases *about* 7 days.

‡ In 1 of these cases *about* 9 days.

** In 9 of these cases *about* 10 days.

†† In 2 of these cases *about* 14 days.

‡‡ In 2 of these cases *about* 21 days.

The average period of incubation of diphtheria in the 115 cases is 8.4 days.

TABLE 9.—*Exhibiting in certain age-groups, the numbers of cases and deaths from Diphtheria, the per cent that the cases in each group were of all cases of known ages; the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group.—Compiled from all reports for the year 1898, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																
Ages in groups of years.	All known ages.	0-1.	1-2.	2-3.	3-4.	4-5.	Under 5.	5-9.	10-14.	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50 and over.
No. of cases.....	*1,869	47	80	114	152	139	532	581	350	148	67	63	46	36	19	12	15
Per cent the cases in each group were of all cases of known ages.	100.	2.5	4.3	6.1	8.1	7.4	28.5	31.1	18.7	7.9	3.6	3.4	2.5	1.9	1.0	0.6	0.8
No. of deaths.....	446	28	45	42	58	43	216	133	58	17	6	7	3	1	1	2	2
Per cent the deaths in each group were of all cases in that group....	23.9	59.6	56.3	36.8	38.2	30.9	40.6	22.9	16.6	11.5	9.0	11.1	6.5	2.8	5.3	16.7	13.3
Per cent the deaths in each group were of deaths, known ages..	100.	6.2	10.1	9.4	13.0	9.6	48.4	29.8	13.0	3.8	1.3	1.6	0.7	0.2	0.2	0.4	0.4
Per cent the deaths in special groups were of all deaths, known ages	-----	48.4					78.3			18.2			3.6				

*Does not include those cases or deaths where the age was not stated.

TABLE 10.—*Exhibiting in certain age-groups, the numbers of cases and deaths from Diphtheria in the year 1898; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths, also totals for the 7 years 1892-98.—Compiled from all reports for the years 1892-98, which stated the ages.*

Year.		Total No. in- cluded	Per cent of cases and deaths in certain age-groups.											
			All ages.	Un- der 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Cases.....	1,869	100	28.5	31.1	18.7	7.9	3.6	3.4	2.5	1.9	1.0	0.6	0.8
	Deaths.....	446	100	48.4	29.8	13.0	3.8	1.3	1.6	0.7	0.2	0.2	0.4	0.4
1892-98.	Cases.....	16,299	100	25.4	32.6	19.0	8.6	4.5	3.3	2.6	1.7	1.0	0.6	0.6
	Deaths.....	3,496	100	42.7	33.6	14.0	4.4	2.0	1.3	0.8	0.5	0.2	0.2	0.4

Of the 16,299 persons sick with diphtheria in the State during the seven years, 1892-98, the ages of whom were reported to this office, the largest percentage were of ages ranging from five to nine years; and 77 per cent of the whole number were of ages under fourteen years.

Of the 3,496 deaths reported to have occurred during the same period the greatest percentage were of ages under five years and 90 per cent died at ages under fourteen years.

TABLE 11.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from Diphtheria, in Michigan in 1898 and during the 6 years 1893-8, also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of non-fatal cases, years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period of age.											
				All ages.	Under five years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Males.....	12.6	631	100	26.0	30.6	21.7	9.2	2.9	3.2	2.2	2.1	0.8	0.6	0.9
	Females..	11.8	792	100	19.2	32.2	19.6	9.2	5.4	4.5	3.7	2.8	1.6	0.8	1.1
1893-8.	Males.....	11.2	5,264	100	22.2	34.7	21.5	9.2	4.1	2.8	2.1	1.6	0.9	0.5	0.5
	Females..	13.3	6,385	100	16.5	30.6	21.6	10.4	6.2	4.4	3.9	2.9	1.6	0.8	1.1

Table 11 shows for 1898 that the average age of non-fatal cases of diphtheria was, for males, 12.6 years, and for females 11.8 years; and that for the six years 1893-98 the average age of males was 11.2 and for females 13.3 years. Also that for both the year 1898 and for the period of years 1893-98, the greatest per cent of cases occurred at ages ranging from five to nine years.

TABLE 12.—*Exhibiting, by sex and in certain age-groups, the per cent of persons who died from Diphtheria in Michigan in 1898 and during the 6 years 1893-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from diphtheria.											
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.							
				All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 years and over.
1898.	Males.....	6.1	195	100	52.3	30.3	10.8	3.6	1.0	0.5	1.5
	Females.....	7.4	251	100	45.4	29.6	14.7	4.0	1.6	2.4	2.4
1893-98.	Males.....	6.9	1,414	100	42.1	36.0	13.1	4.9	1.7	0.7	1.4
	Females.....	8.2	1,606	100	38.0	34.3	16.3	4.5	2.0	2.1	2.8

Table 12 shows for 1898 that the average age of decedents from diphtheria was, for males 6.1 years, and for females 7.4 years; and for the six years 1893-98 that the average age of decedents from diphtheria was, for males 6.9 years and for females 8.2 years. Also that the greatest per cent of decedents, both in 1898 and in the period 1893-98 were of ages under five years.

AVERAGE DURATION OF DIPHtheria.—FATAL AND NON-FATAL CASES.

TABLE 13.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from Diphtheria, in Michigan, during the year 1898, and in the 6 years 1893-98. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of diphtheria.											
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.								
			All cases.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 and over.
1898.	Males.....	146	100	66	18	12	2	0	1	0	1
	Females.....	177	100	64	24	8	2	1	0	0	1
1893-8.	Males.....	897	100	47	31	12	5	2	1	1	1
	Females.....	1,024	100	48	30	13	5	2	1	0	1

In 1898 the average duration of fatal cases of diphtheria was, for males 5.7 days, for females 5.4 days, and for both sexes 5.6 days.

TABLE 14.—*Exhibiting, by sex of patient, the duration (in days) of non-fatal cases of sickness from Diphtheria, in Michigan, during 1898 and the 6 years 1893-98. Per cent of non-fatal cases arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of diphtheria.											
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of non-fatal cases in each period of days.								
			All periods.	1 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 days and over.
1898.	Males	528	100	13	39	21	10	10	3	2	2
	Females	628	100	14	38	24	13	7	3	0	1
1893-8.	Males.....	3,075	100	10	33	26	14	9	4	2	2
	Females	3,734	100	10	34	25	15	9	3	1	2

In 1898 the average duration of non-fatal cases of diphtheria was, in males 10.9 days, in females 11.8 days, and in both sexes 11.4 days.

SCARLET FEVER IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health 425 outbreaks of scarlet fever in 352 localities in Michigan, which resulted in 2,409 cases and 100 deaths.

Scarlet fever in 1898, compared with previous years.

From year to year there has been a steady improvement, both in the methods adopted by the State Board of Health in securing and compiling reports, and in the efforts made by local health authorities throughout the State to furnish in their reports the information desired by the State Board. These facts, together with the constantly increasing population, make it difficult to determine the exact increase or decrease of prevalence of the disease in the State by comparison of the numbers of outbreaks of the disease, and the cases and deaths resulting therefrom; and these facts should be borne in mind in referring to Table 1. While these facts might reasonably be expected to produce a constant increase in the reported prevalence of the disease, Table 1 shows that for the year 1898 the average numbers of cases and deaths per outbreak, and the fatality from this disease, were less than the averages for the fourteen years, 1884-97.

TABLE 1.—SCARLET FEVER IN MICHIGAN.—*Numbers of reported outbreaks, localities (in which they occurred), cases and deaths; average numbers of cases and deaths per outbreak, and the per cent of cases which proved fatal, as reported for the year 1898; with the departure of the same for 1898 from the average of the same for the 14 years, 1884-97.*

Year.	Reported outbreaks.	Reported localities.	Reported cases.	Av. No. of cases per outbreak.	Reported deaths.	Av. No. of deaths per outbreak.	Deaths per 100 cases.
1898.....	425	352	2,409	5.67	100	.24	4.2
Average for fourteen years, 1884-97.	473	401	3,994	8.44	232	.49	5.8
Departure of 1898 from the average for 14 years, 1884-97	-48	-49	-1,585	-2.77	-132	-.25	-1.6

Sickness-rates, by counties, from reported scarlet fever.

Table 2 shows that the greatest sickness-rate from reported scarlet fever, by counties, was in Oscoda County, where the ratio of cases to population was 111.24 to 10,000. This was nearly double the sickness-rate for any other county, and over eleven times the average rate for the State.

The lowest sickness-rate, by counties, .40 of one case per 10,000 inhabitants, was in Menominee County. From sixteen counties, eight of which were in the Upper Peninsula and eight in the northern part of the Lower Peninsula,—having an aggregate of 102,928 inhabitants,—no scarlet fever was reported during the year.

TABLE 2.—Numbers of cases and deaths reported from Scarlet Fever, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, clerks, etc.)

State and counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population of		Counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	2,409	100	10.08	.42	Keweenaw Lake.....	2,851 5,289	0 4	0 0	0 7.56	0 0
Alcona.....	5,427	15	0	27.64	0	Lapeer.....	28,545	27	0	9.46	0
Alger.....	1,532	0	0	0	0	Leelanau.....	10,967	3	0	2.74	0
Allegan.....	39,417	50	1	12.68	.25	Lenawee.....	48,634	103	2	21.18	.41
Alpena.....	19,853	7	0	3.53	0	Livingston.....	20,016	12	0	6.00	0
Antrim.....	14,442	0	0	0	0	Luce.....	2,241	0	0	0	0
Arenac.....	8,203	3	0	3.66	0	Mackinac.....	6,644	0	0	0	0
Baraga.....	5,428	0	0	0	0	Macomb.....	33,961	81	9	23.85	2.65
Barry.....	23,615	23	1	9.74	.42	Manistee.....	27,998	13	0	4.64	0
Bay.....	66,196	68	1	10.27	.15	Marquette.....	39,936	14	0	3.51	0
Benzie.....	10,889	0	0	0	0	Mason.....	20,459	36	11	17.60	5.38
Berrien.....	49,985	36	1	7.20	.20	Mecosta.....	21,761	14	0	6.43	0
Branch.....	25,623	2	0	.78	0	Menominee.....	24,947	1	1	.40	.40
Calhoun.....	51,443	11	0	2.14	0	Midland.....	15,779	7	0	4.44	0
Cass.....	21,399	34	0	15.89	0	Missaukee.....	8,862	3	1	3.39	1.13
Charlevoix.....	12,322	21	3	17.04	2.43	Monroe.....	34,025	27	1	7.94	.29
Cheboygan.....	15,814	46	3	29.09	1.90	Montcalm.....	35,679	86	2	24.10	.56
Chippewa.....	18,625	5	1	2.68	.54	Montmorency.....	3,389	0	0	0	0
Clare.....	8,394	0	0	0	0	Muskegon.....	34,635	45	3	12.99	.87
Clinton.....	26,015	82	2	31.52	.77	Newaygo.....	17,774	27	0	15.19	0
Crawford.....	2,458	0	0	0	0	Oakland.....	44,107	33	0	7.48	0
Delta.....	23,194	3	2	1.29	.86	Oceana.....	17,500	3	0	1.71	0
Dickinson.....	15,448	17	1	11.00	.65	Ogemaw.....	5,693	0	0	0	0
Eaton.....	33,142	22	0	6.64	0	Ontonagon.....	9,990	0	0	0	0
Emmet.....	12,638	77	2	60.93	1.58	Osceola.....	18,320	1	0	5.46	0
Genesee.....	41,676	39	0	9.36	0	Oscoda.....	1,708	19	0	111.24	0
Gladwin.....	5,592	21	2	37.55	3.58	Otsego.....	5,316	9	0	16.93	0
Gogebic.....	15,000	0	0	0	0	Ottawa.....	42,808	31	2	7.24	.47
Gd. Traverse.....	21,675	3	0	1.38	0	Presque Isle.....	7,135	0	0	0	0
Gratiot.....	28,884	9	0	3.12	0	Rosecommon.....	1,281	0	0	0	0
Hillsdale.....	29,884	21	1	7.03	.33	Saginaw.....	81,421	80	0	9.83	0
Houghton.....	52,961	7	0	1.32	0	Sanilac.....	35,301	23	0	6.52	0
Huron.....	35,967	9	1	2.50	.28	Schoolcraft.....	8,436	14	0	16.60	0
Ingham.....	41,712	75	0	17.98	0	Shiawassee.....	34,756	16	1	4.60	.29
Ionia.....	36,839	97	8	26.33	2.17	St. Clair.....	56,537	112	5	19.81	.88
Iosco.....	9,456	3	0	3.17	0	St. Joseph.....	24,818	26	0	10.48	0
Iron.....	5,561	0	0	0	0	Tuscola.....	36,316	33	2	9.09	.55
Isabella.....	24,094	8	0	3.32	0	Van Buren.....	31,577	33	0	10.45	0
Jackson.....	48,039	26	0	5.41	0	Washtenaw.....	44,808	10	2	2.23	.45
Kalamazoo.....	44,839	32	0	7.14	.37	Wayne.....	327,808	452	21	13.79	.64
Kalkaska.....	6,120	4	0	6.54	0	Wexford.....	16,816	16	2	9.51	1.19
Kent.....	133,954	119	5	8.88	0						

*Population estimated by average annual increase, arithmetical method, based on U. S. Census of 1890 and the State Census of 1894; computed in the office of the State Board of Health.

Death-rates, by counties, from reported scarlet fever.

Table 2 shows that the greatest death-rate from reported scarlet fever, 5.38 deaths per 10,000 inhabitants was in Mason County.

From thirty-five counties, from which an aggregate of 660 cases of scarlet fever were reported, there were no deaths reported from this disease. The lowest death-rate, in counties from which deaths from this disease were reported, was in Bay County. This county had .15 of one death per 10,000 inhabitants.

Fatality, by counties, from reported scarlet fever.

The fatality from scarlet fever in 1898,—the proportion of reported cases which proved fatal, was, for the whole State, 4.2 per cent, or about one death to twenty-four cases. In Menominee County the only case reported proved fatal. In Delta County two of the three cases reported were fatal cases. The lowest fatality in counties from which deaths were reported, 1.5 per cent of reported cases, occurred in Bay County.

Distribution of scarlet fever in cities, villages and townships.

From the data in Table 3 it may be observed that 67 per cent of the cities, 22 per cent of the villages, and 19 per cent of the townships, were infected with scarlet fever. But the average population of the cities is over fourteen times the average population of the villages.* The highest case-rate (13.88) and death-rate (.55) occurred in the villages; the lowest case-rate (8.22) and death-rate (.33) occurred in the townships.

TABLE 3.—*Exhibiting the numbers of outbreaks and cases of and deaths from Scarlet Fever which occurred in the cities, villages and townships of Michigan in 1898, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages, and townships. (Compiled from reports of local health officials to the Secretary of the State Board of Health.)*

Classes of political divisions.	Popula- tion.†	Health jurisdictions.	Outbreaks in:			Cases.	Deaths.	Fatality. (Per cent cases of deaths.)	Rates per 10,000 population	
			Localities.		No. of				Cases.	Deaths.
			No. of	Per cent of all local- ities.						
State (83 counties).....	2,389,393	1,582	352	22	425	2,409	100	4.2	10.08	.42
Cities.....	930,834	76	51	67	71	1,065	46	4.3	11.44	.49
Villages.....	256,485	300	66	22	76	356	14	3.9	13.88	.55
Townships.....	1,202,074	1,206	235	19	278	988	40	4.0	8.22	.33

†Estimated by arithmetical method in the office of the State Board of Health.

The last line of figures in Table 4, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an out-

*The average population of the cities is 12,248, of the villages, 855, and of the townships, 997.

break is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. Of the twenty-seven outbreaks reported as having ended in January, seventeen were outbreaks which began the preceding year, and in which there were no new cases reported in 1898. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were sixty-four more beginnings than endings of outbreaks reported during the year 1898.

SCARLET FEVER IN EACH MONTH OF THE YEAR, 1898.

TABLE 4.—*Exhibiting the reported number of outbreaks of Scarlet Fever which began, the number which ended, and the number which were present, in each month of the year 1898, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began.....	35	35	29	31	21	20	26	21	27	38	43	59	385
Number ended.....	27	27	37	25	31	26	20	16	22	22	32	53	321
Number present...	77	82	84	76	72	53	52	52	61	76	96	117	-----

TABLE 5.—*Exhibiting the number and per cent of localities infected with Scarlet Fever, and the number and per cent of cases of Scarlet Fever present, and the number and per cent of cases taken sick, in Michigan in each month during the year 1898.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Localities, number.....	77	81	83	76	72	56	52	52	61	76	95	114
Per cent.....	22	23	24	22	20	16	15	15	17	22	27	32
Cases present, number....	302	293	263	233	220	174	191	170	197	251	349	478
Per cent.....	13	12	11	10	9	7	8	7	8	10	14	20
Cases taken sick	216	185	179	149	140	125	124	118	140	174	252	346
Per cent	9	8	7	6	6	5	5	5	6	7	10	14

The second line of figures in Table 5 shows the per cent the localities infected in each month are of the exact number of localities (352) *reported* to this office for the year 1898.

The third line of figures in Table 5 shows the number of cases reported sick in any part of each month.

As some of the cases were sick longer than one month they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total of reported cases in 1898.

The fourth and last lines of figures in this table (5) show the per cent the cases present and the per cent the cases taken sick, in each month, are of the exact number of cases (2,409) *reported* to this office for the year 1898.

Source of contagium of scarlet fever, how the disease is spread, and the vitality of the contagium.

Of the 2,409 cases of scarlet fever reported during the year 1898, the local health officers reported the source of contagium, as follows: Traced to a former case, 525; probably traced to a former case, 48; attributed to infected houses, articles, clothing, etc., 4; source of contagium unknown, 1,200; source of contagium not stated, 587; traced to an outside jurisdiction, 36; probably from an outside jurisdiction, 9.

The germ of scarlet fever is not yet demonstrated; but that there is a germ seems to be proved by the known communicability of the disease.

Reports of health officers and physicians indicate that the scarlet fever germ frequently retains its vitality for a long time outside of the human body, in an apparently dormant or inactive state, in houses, clothing, carpets, furniture, etc., and is then capable of developing scarlet fever in persons coming into such houses or in contact with or near such articles, thus showing the importance of carefully disinfecting all infected houses and articles, even where they are not to be used for a long time.

The following quotation, from the report of the health officer of Battle Creek, is one of the instances reported which shows the communicability of this disease:

"The first case of scarlet fever was reported from 337 Kalamazoo St., on December 20. The family was visited by your health officer and the premises quarantined. The case, though mild, was isolated as much as possible from the rest of the family, none of whom caught the disease, but on December 31 a twelve or thirteen-year-old boy of the family ran away and spent a portion of the afternoon coasting with children from the vicinity of the overhead bridge on Upton Ave. Among them was F—— Y——, aged nine, of 47 Grand Trunk Ave., who was in direct contact with the boy who had violated the quarantine regulations. In three days the Y—— boy was taken severely ill with what proved to be a malignant form of scarlet fever, and died four days later. Two older brothers were stricken with the disease just four days after F—— was taken sick. Owing to the severity of the disease and a complication in one case, this family was under absolute quarantine for fifty days.

"There could be no stronger evidence of the direct transmission of this fatal disease than here presented, and the result showed conclusively the danger of allowing any member of a family, in which scarlet fever exists, to mingle with other persons. The Y—— family faithfully observed the requirements of the health officer and no other case developed from these. There have been but six cases reported to the board and all have been required to observe the same strict quarantine. I believe the results have demonstrated its efficacy."

Movements of contagium of scarlet fever.

Table 6, "Movements of contagium," shows the sources and directions of movements of scarlet fever in Michigan, where the contagium was reported by health officers to have been introduced into their jurisdictions from localities outside the State, or from other jurisdictions within the State.

TABLE 6.—*First, second and third localities, where the second locality was infected with Scarlet Fever from the first, and the third was infected from the second; and the numbers of cases and deaths from Scarlet Fever in the first, second and third localities with the dates of the beginning and ending of each outbreak. (Compiled from reports of health officers who were able to trace the source of contagium to other localities.)*

First localities from which Scarlet Fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Alcona county: Harrisville village..... (May 6-May 27.)	1	0	Alcona county: Harrisville township... (May 6-May 22.)	4	0			
Allegan county: Monterey township.....	*	----	Allegan county: Heath township..... (Jan. 24-Feb. 28.)	6	0			
Allegan county: Trowbridge township... (July 14-Sept.)	2	0	Allegan county: Allegan village..... (July 14-July 28.)	1	0			
Allegan county.....	----	----	Kent county: Wyoming township.... (Jan. 4-Mar.)	7	0			
Barry county: Hastings city.....	1	0	Barry county: Nashville village.....	12	0			
Berrien county: Benton township..... (April 25-May 12.)	1	0	Berrien county: Benton Harbor city... (Nov. 9-June 3, 1899.)	36	1			
			Cheboygan county: Benton township..... (June-June.)	1	0			
Cheboygan county: Cheboygan city..... (June-June, 1899.)	58	3	Otsego county: Chester township..... (Sept. 29-Nov. 13.)	5	0			
			Gaylord village..... (Sept. 30-Nov. 24.)	3	0			
Cheboygan county: Ellis township..... (July-Dec. 13.)	4	0	Cheboygan county: Nunda township..... (Aug. 9-Sept. 4.)	1	0			
Clinton county: St. Johns village..... (Apr. 16-June 30.)	5	2	Clinton county: Dallas township..... (Apr. 20-May 2.)	5	0			
Emmet county: Harbor Springs village..	*	----	Charlevoix county: Melrose township..... (July —.)	2	0			
Ingham county: Alaiedon township.....	3	0	Ingham county: Meridian township....	3	0			
Ingham county: Lansing city..... (Jan. 1-Mar. 1898.)	39	0	Clinton county: Riley township..... (Dec., 1897-Mar. 1.)	4	0			
Ingham county: Lansing township.....	4	0	Ingham county: Meridian township....	1	0			
Ionia county: Berlin township..... (Apr. 3-May.)	11	0	Ionia county: Orange township..... (Apr. 14-Apr. 30.)	1	0			
Iosco county: Au Sable township.....	2	0	Alcona county: Harrisville township... (Oct. 26-Dec. 20.)	10	0			
Jackson county: Hanover village..... (Aug. 20-Aug. 30.)	1	0	Hillsdale county: Somerset township....	2	0			

*Scarlet fever was not reported to this office by the health officer of the "first" locality at the time it was said to have spread from there; showing that the disease, if present, was neglected; probably it was not reported to the health officer as the law requires.

TABLE 6.—CONTINUED.—*Movement of infection.*

First localities from which Scarlet Fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Jackson county: Jackson city..... (Mar. 19-July 27.)	9	0	Jackson county: Brooklyn village..... (July-Oct. 5.)	3	0			
Jackson county: Parma village.....	*	—	Jackson county: Rives township..... (Nov. 5-Nov. 25.)	2	0			
Kalamazoo county: Kalamazoo city..... (Aug. 20-June, 1899.)	8	0	Kalamazoo county: Comstock township.... (Nov. 10-Dec. 17.)	6	0			
Kent county: Byron township..... (Jan. 2-Jan. 15.)	1	1	Kent county: Sparta village..... (Jan.-June 12.)	25	1			
Kent county: Lowell village.....	*	—	Ionia county: Boston township..... (Apr. 22-May 2.)	3	0			
Kent county: Grand Rapids city..... (Jan. 1-Dec. 31.)	58	2	Kent county: East Grand Rapids vil... (Oct. 28-Nov. 22.)	1	0			
Kent county: Sand Lake village..... (Dec. 8-Feb. 27, 1899.)	9	2	Kent county: Nelson township..... (Dec. —)	1	0			
Lapeer county: Lapeer city..... (Jan. 14-Feb.)	4	0	Lapeer county: Arcada township..... (Jan. 7-Feb. 15.)	7	0			
Lapeer county: Metamora village..... (Mar. 9-May 30.)	4	0	Lapeer county: Hadley township..... (Mar. 11-Apr. 1.)	1	0			
Leelanau county: Kassan township..... (Dec. —)	1	0	Leelanau county: Glen Arbor township... (Dec. 22-Jan. 13, 1899.)	4	0			
Lenawee county: Palmyra township..... (Mar. 10-Mar. 29.)	1	0	Lenawee county: Blissfield village..... (Dec. —)	1	0			
Livingston county: Howell village..... (Apr. 25-May 30.)	1	0	Genesee county: Davison village..... (July-July.)	3	0			
Livingston county: Osceola township.....	*	—	Livingston county: Cohoctah township... (Oct. 8-Oct. 20.)	1	0			
Macomb county: Clinton township..... (Jan. 14-Feb. 26.)	4	2	Macomb county: Erin township..... (Jan. 10-Apr. 11.)	9	1			
Macomb county: Mt. Clemens city..... (Jan. 14-May.)	17	2	Macomb county: Macomb township..... (Mar. 4-Mar. 21.)	4	1			
Marquette county: Ishpeming city..... (Apr. 9—)	5	0	Dickinson county: Waucedah township... (Dec. 1-Dec. 4.)	1	0			
Mason county: Victor township..... (Jan.-Feb.)	3	3	Mason county: Ludington city..... (May 6-Sept. 1.)	7	0			

*This foot-note is printed at the bottom of the first page.

†This outbreak is a continuation of one which began in 1897.

TABLE 6.—CONTINUED.—*Movement of infection.*

First localities from which Scarlet Fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Montcalm county: Howard City village.....	*	---	Ionia county: Belding city..... (June 3-July 7.)	2	0			
Oakland county: Oxford township.....	*	---	Oakland county: Addison township..... (Dec. 12 —)	3	0			
Otsego county: Charlton township.....	*	---	Otsego county: Chester township..... (Nov. 5-Nov. 12.)	1	0			
Ottawa county: Grand Haven city..... (Oct.-Nov. 21.)	5	0	Ottawa county: Polkton township..... (Oct. 11-Oct. 18.)	1	0			
Ottawa county: Holland township..... (Feb. 10-Mar. 13.)	3	0	Allegan county: Allegan township..... (Sept. 3-Sept. 7.)	1	0			
Saginaw county: Richland township..... (Oct.-Dec.)	10	0	Midland county: Ingersoll township..... (Nov. 27-June 27, 1899.)	25	0			
			Gratiot county: Alma village..... (Nov. 7-Nov. 18.)	1	0			
Saginaw county: Saginaw city..... (Jan. 1-Dec. 31.)	49	0	Midland county: Midland City..... (Oct.-Nov. 25.)	1	0			
Schoolcraft county: Manistique village..... (Nov.-Jan., 1899.)	6	0	Saginaw county: Bridgeport township.. (— Dec.)	15	0	Genesee county: Davison township..... (Dec.-Jan. 2, 1899.)	4	0
St. Clair county: Port Huron city..... (Apr.-Feb. 11, 1899.)	85	4	Schoolcraft county: Doyle township..... (Dec. 10-Jan. 20.)	1	0			
			St. Clair county: Grant township..... (Apr.-Apr. 14.)	1	0			
			Kimball township..... (Dec. 28-Jan. 19, 1899.)	2	0			
			St. Clair township..... (Aug. 26-Oct.)	2	1			
St. Joseph county: Mendon township..... (Aug. 20-Oct.)	3	0	St. Joseph county: Three Rivers city..... (Sept. 14-Nov.)	6	0			
St. Joseph county: Nottawa township..... (Mar. 20-Apr. 20)	9	0	St. Joseph county: Colon township..... (Oct. 3-Oct. 10.)	1	0			
Tuscola county: Akron village.....	*	---	Tuscola county: Fairgrove township.... (Dec. 22-Feb., 1899.)	5	0			
Tuscola county: Fairgrove township.... (Sept. —.)	9	2	Tuscola county: Akron township..... (Sept. 17-Jan., 1899.)	6	0			
Van Buren county: Bangor township.....	*	---	Allegan county: Casco township..... (Dec. 29 —)	1	0			
Van Buren county: Geneva township.....	1	0	Van Buren county: South Haven township	3	0			

*This foot note is printed at the bottom of the first page.

TABLE 6.—CONTINUED.—*Movement of infection.*

First localities from which Scarlet Fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Van Buren county: Gobleville village..... (Oct.-Nov. 18.)	2	0	Van Buren county: Bloomington township (Oct. 26-Nov. 12.)	3	0			
			Bay county: West Bay City..... (June 20-1899.)	45	1			
			Macomb county: New Haven village... (Aug. 4-Nov. 25.)	8	0			
Wayne county: Detroit..... (Jan.-Dec.)	348	12	Wayne county: Plymouth township... (July 16-Aug. 3.)	1	0			
			Plymouth village... (Nov. 9-Nov. 26.)	2	0			
			Taylor township... (Oct. 17-Oct. 29.)	1	0			
Wayne county: Springwells township... (Jan. 1-Dec. 31.)	52	2	Wayne county: Delray village..... (July-Jan. 14, 1899.)	17	6			
Wexford county: Boon township.....	*	---	Wexford county: Cherry Grove township (July 26-Aug. 9.)	1	0			
Northern Peninsula.....			Tuscola county: Elkland township... (Nov. 6-Dec. 18.)	11	0			
Movement of infection of Scarlet Fever into Michigan from outside the State.								
Canada.....			Shiawassee county: Durand village..... (Mar. 10-Apr. 7.)	1	0			
Canada.....			St. Clair county: St. Clair city..... (Aug. 22-Sept. 24.)	1	0			
Chicago.....			Chippewa county: Sault Ste. Marie city... (June 6-June 21.)	1	1			
			Van Buren county: Keeler township... (July 14-Aug. 27.)	3	0			
Washington, D. C.....			Monroe county: Monroe city..... (Nov. 11-Nov. 29.)	2	0			
Indiana: Elkhart.....			St. Joseph county: Constantine village... (June 1-June 30.)	3	0			
Indiana: Goshen.....			Cass county: Porter township..... (Feb. 5-Mar.)	2	0			
Montana: Butte.....			Ionia county: Ronald township... (Sept. 16-Dec. 31.)	6	0			
Ohio: Fayette.....			Hillsdale county: Wright township... (Feb. 21-Mar. 1.)	3	0			

*This foot note is printed at the bottom of the first page.

TABLE 6.—CONCLUDED.—*Movement of infection into Michigan.*

First localities from which Scarlet Fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
West Virginia: Short Creek.....			Wayne county: Plymouth village..... (Nov. 9-Nov. 26.)	2	0			
Wisconsin: Green Bay.....			Schoolcraft county: Thompson township... (Oct. 25 Nov. 15.)	1	0			
Probable movement of infection.								
Charlevoix county: Eveline township..... (Jan. 1*-Feb. 12.)	9	0	Charlevoix county: East Jordan village... (Jan. 3-Jan. 30.)	1	0			
Emmet county: Petoskey city..... (1897-Nov. 4.)	65	2	Emmet county: Bear Creek township.. (July 24-Oct. 3.)	8	0			
Gratiot county.....			Clinton county: Lebanon township..... (Dec. 15-Dec. 25.)	1	0			
Houghton county: Calumet.....	4	0	Marquette county: Michigamme township (Dec. 29-Feb. 8.)	2	0			
Huron county: Sand Beach township..	1	0	Huron county: Sherman township.... (Oct. 24 Oct. 27.)	1	1			
Ionia county: Belding city..... (June July.)	2	0	Montcalm county: Greenville city..... (Nov. 1-Nov.)	2	0			
Ionia county: Ionia city..... (Oct. 30-Jan. 8, 1899.)	13	5	Ionia county: Ionia township..... (Dec. 13-Dec. 31.)	1	1			
Macomb county: Lenox township..... (Sept. 24-Oct. 21)	5	0	St. Clair county: Casco township..... (Dec. 1-Jan. 7, 1899.)	3	0			
Mason county: Ludington city..... (— Apr. 27.)	6	6	Mason county: Riverton township.... (Jan. 12-Feb. 15.)	1	0			
Mecosta county: Deerfield township....	†		Mecosta county: Morley village..... (Dec. 27-Jan. 3, 1899.)	2	0			
Washtenaw county: Bridgewater township..	†		Lenawee county: Franklin township..... (Nov. 15-Dec. 1.)	1	0			
Probable movement of infection of Scarlet Fever into Michigan from outside the State.								
Ohio.....			Lenawee county: Seneca township..... (Aug. 28 Sept. 15.)	2	0			

*This outbreak is a continuation of one which began in 1897.

†This foot-note is printed at the bottom of the first page.

Estimated number of cases of scarlet fever prevented, and number of lives saved, by isolation and disinfection.

Tables 7 and 8 and the accompanying diagram compare the average numbers of cases and deaths in outbreaks of scarlet fever where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where those measures were neglected.* By Table 8 it may be seen that during the twelve years, 1887-98, there were over five times as many cases and deaths in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 7 it may be seen that during the year 1898 there were reported to the office of the State Board of Health 397 outbreaks of scarlet fever, with 1,759 cases and 74 deaths.† Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 3,367 cases and 175 deaths, and taking from these respectively the cases (1,759) and deaths (74), which did occur, leaves 1,608 cases and 101 deaths indicated as prevented in these 397 outbreaks, by isolation and disinfection. By the same method for each year the indicated saving in the 5,763 outbreaks which occurred during the twelve years, 1887-98, is 33,240 cases and 1,079 lives. This is shown in Table 8.

*In the compilation of the reports for Tables 7 and 8 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate and disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

†*Definition of outbreak.*—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of years require that outbreaks be counted as closed, at the end of the year; while in comparing outbreaks for testing the value of isolation and disinfection it is necessary to take complete outbreaks, even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

TABLE 7.—SCARLET FEVER IN MICHIGAN IN 1898: Exhibiting the average numbers of cases and deaths per outbreak;—(1) in all the 397 outbreaks reported; (2) in the 140 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 7 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 55 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 26 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 29 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 52 outbreaks in which isolation and disinfection were both enforced.

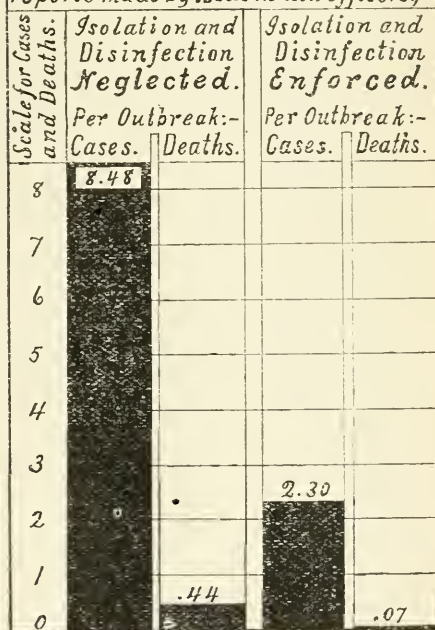
	(1) All outbreaks. (397 outbreaks.)*		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (140 outbreaks.)		(3) Disinfection enforced—Isolation doubtful. (7 outbreaks.)		(4) Isolation enforced—Disinfection doubtful. (55 outbreaks.)		(5) Disinfection enforced—Isolation neglected. (26 outbreaks.)		(6) Isolation enforced—Disinfection neglected. (29 outbreaks.)		(7) Isolation and disinfection both neglected. (52 outbreaks.)		(8) Isolation and disinfection both enforced. (88 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	1,759	74	645	24	12	1	158	8	194	7	107	5	411	23	202	6
Averages.	4.43	.19	4.61	.17	1.71	.14	2.87	.15	7.46	.27	3.69	.17	8.48	4.41	42.30	4.07

* These do not include the cases and deaths in Detroit, Grand Rapids, Lansing, Saginaw, Bay City, Kalamazoo, Port Huron, and Springwells township, because of the difficulty in determining the beginning and ending of an outbreak in these cities or township, in which the disease was present in some part of the city or township nearly all the time.

† These figures are graphically represented in the diagram opposite this table, entitled "Isolation and disinfection restrict scarlet fever."

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet fever in Michigan in 1898:—Exhibiting the average numbers of cases and deaths per outbreak:—in all outbreaks in which Isolation and Disinfection were both neglected, and in all outbreaks in which both were enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local Health Officers.)



This diagram graphically represents the lower line of figures in the last four columns of Table 7.

[PLATE 1028]

TABLE 8.—SCARLET FEVER.—Exhibiting for the 12 years, and for each of the 12 years 1887-98, the numbers of reported outbreaks, cases and deaths; also for this 12-year period, the average numbers of cases and deaths per outbreak in all outbreaks; in those outbreaks in which isolation or disinfection or both were doubtful; isolation and disinfection both neglected; isolation and disinfection both enforced; and, also, the numbers of cases and deaths indicated as having been prevented by isolation and disinfection.

Years.	* All outbreaks.				Isolation or disinfection, or both, not mentioned, or statements doubtful.				Isolation and disinfection both neglected.				Isolation and disinfection both enforced.				Cases and deaths indicated as having been prevented by isolation and disinfection.			
	Outbreaks.	Cases.	Deaths.		Outbreaks.	Cases.	Deaths.		Outbreaks.	Cases.	Deaths.		Outbreaks.	Cases.	Deaths.		Outbreaks.	Cases.	Deaths.	
1887.....	299	1,882	141		190	1,200	93		32	440	34		64	148	11		2,220	177		
1888.....	340	1,838	112		225	955	74		61	724	33		36	80	3		2,198	72		
1889.....	417	2,822	123		284	1,453	61		72	1,208	38		52	140	10		4,175	156		
1890.....	477	3,054	115		302	1,711	67		94	1,137	46		42	76	1		2,718	66		
1891.....	602	4,935	193		380	3,012	91		141	1,704	66		42	107	1		2,342	90		
1892.....	622	5,240	306		377	2,944	188		110	1,621	59		42	97	7		3,928	30		
1893.....	667	5,219	327		387	3,197	204		124	1,511	99		60	157	8		2,912	207		
1894.....	662	4,349	175		378	2,366	93		104	1,348	42		74	187	9		4,231	90		
1895.....	555	2,905	85		275	1,259	42		82	1,138	27		92	162	4		4,798	98		
1896.....	389	1,534	42		148	485	15		80	681	16		78	153	4		1,770	36		
1897.....	336	1,531	52		130	654	21		63	427	17		59	127	5		747	39		
1898.....	397	1,759	74		140	645	24		52	441	23		88	202	6		1,608	101		
Totals.....	5,763	37,069	1,745		3,216	19,881	973		1,015	12,380	500		739	1,636	69		433,653	41,162		
																	438,240	41,079		
Averages, 12 years.....	480	3,089	145		298	1,657	81		85	1,032	42		61	136	6		2,805	97		
Average cases and deaths per outbreak for twelve years, 1887-98.....		6.43	.30			6.18	.17			12.20	.49			2.24	.09					

* Outbreaks in Detroit, Grand Rapids and a few other localities, where the disease was present throughout the whole year, are not included, owing to the difficulty in determining the beginning and ending of an outbreak in these localities. The localities which are thus excluded in 1898, are given in a foot-note to Table 7 of this article; and for previous years, in foot-notes to similar tables in articles on scarlet fever for those years.

† The number of cases and deaths in this double column are found by multiplying "all outbreaks" for each year by the average numbers of cases or deaths per outbreak. In those outbreaks in which isolation and disinfection were both neglected, for that year, and deducting from the results thus obtained, the cases or deaths, as the case may be, which were reported to have occurred that year. ‡ The two sets of numbers appearing in this column are based on two distinct methods of solution which are explained as follows:—(1) The 33,692 cases and 1,161 deaths are totals of the columns representing cases and deaths saved as explained in the + foot-note. (2) The 37,240 cases and 1,079 deaths are obtained by multiplying the average number of cases and deaths per outbreak for the twelve years, 1887-98 (12.20 and .49, where isolation and disinfection were neglected) by the total number of outbreaks, to find the numbers which would have occurred if all outbreaks had been neglected, and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the twelve-year period.

PERIOD OF INCUBATION, IN SCARLET FEVER.

TABLE 9.—*Exhibiting the reported period of incubation, stated in days, in 110 instances of Scarlet Fever. Compiled from reports of health officers in Michigan, for the year 1898.*

Incubation period—days.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	21	24
Instances in each period.....	2	4	*8	4	7	+6	†8	§9	¶7	15	1	**9	1	††20	2	‡†1	1	§§4	1

*In 1 of these instances, reported as about 3 days. †In 2 of these instances reported as about 6 days. ‡In 4 of these instances, reported as about 7 days. §In 2 of these instances, reported as about 8 days. ¶In 3 of these instances, reported as about 9 days. ||In 9 of these instances, reported as about 10 days. **In 7 of these instances, reported as about 12 days. ††In 6 of these instances, reported as about 14 days. ‡†In 1 instance, reported as about 16 days. §§In 1 of these instances, reported as about 21 days.

The average period of incubation in the 110 reported instances is 9.5 days; the greatest number of instances given in any single period was in the fourteen-day period.

Ages of greatest prevalence of, and mortality from, scarlet fever.

Of the total numbers of cases and deaths reported to this office for the year 1898, the number of deaths per 100 cases was 4.2; and in the smaller numbers of cases and deaths of which the ages were stated, the

TABLE 10.—*Exhibiting in certain age-groups, the numbers of cases and deaths from Scarlet Fever; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; and the per cent that the deaths in each group were of the cases in that group.—Compiled from all reports for the year 1898 which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																		
Ages in groups of years.....	All ages known.	0-1.	1-2.	2-3.	3-4.	4-5.	0-5.	5-9.	10-14.	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50-54.	55-59.	Over 60.
No. of cases.....	*1,603	35	55	91	121	151	453	695	290	72	39	21	11	16	3	1	1	1	0
Per cent the cases in each group were of all cases.	100	2.2	3.4	5.7	7.5	9.4	28.3	43.4	18.1	4.5	2.4	1.3	.7	1.0	.2	.1	.1	.1	0
No. of deaths.....	99	6	11	14	9	15	55	31	8	2	1	0	1	1	0	0	0	0	0
Per cent the deaths in each group were of cases in that group.....	6.2	17.1	20.0	15.4	7.4	9.9	12.1	4.5	2.8	2.8	2.6	0	.9	.6	0	0	0	0	0
Per cent the deaths in each group were of all deaths	100	6.1	11.1	14.1	9.1	15.1	55.6	31.3	8.1	2.0	1.0	0	1.0	1.0	0	0	0	0	0
Per cent the deaths in special groups were of all deaths		55.6					86.9			8.1	5.0				0				

* Does not include those cases or deaths where the age was not stated.

number of deaths per 100 cases was 6.2; of the 2,409 cases of scarlet fever reported, of which 100 were fatal cases, the ages were stated for 1,603 cases, 99 of these being fatal cases, the age of all decedents having been stated except in one instance.

Table 10 shows that the fatality in children under five years of age was greater than in any other age-period.

Tables 11 and 12 show that the greatest per cent of all deaths from scarlet fever was in children under five years of age, both for the year 1898 and for the seven years, 1892-98.

The average age of decedents for the six years, 1893-98, was 5.4 for males and 6.3 years for females. The average age of cases recovering from this disease for the six years was 19.1 years for each sex.

TABLE 11.—*Exhibiting in certain age-groups, the numbers of cases and deaths from Scarlet Fever in the year 1898, and in the seven years, 1892-98; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths. Compiled from all reports for the years 1892-98, which stated the ages.*

Year.		Total No. included.*	Per cent of cases and deaths in certain age-groups.										
			All ages.	0 to 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 years and over.
1898.	Cases.....	1,603	100	28.3	43.4	18.1	4.5	2.4	1.3	.7	1.0	.2	.2
	Deaths.....	99	100	55.6	31.3	8.1	2.0	1.0	0	1.0	1.0	0	0
1892-98.	Cases.....	15,706	100	32.8	40.5	16.6	5.3	2.0	1.2	.7	.5	.2	.1
	Deaths.....	704	100	56.4	28.3	9.9	2.8	1.4	.3	.4	.1	.3	0

*In this column cases include both fatal and non-fatal cases.

TABLE 12.—*Exhibiting, by sex, and in certain age-groups, the per cent of persons who died from Scarlet Fever in Michigan, during the year 1898, and the averages for the 6 years, 1893-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from scarlet fever.														
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.										
				All ages.	Under 5 years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 years and over.
1898.	Males.....	5.6	48	100	56.3	29.2	8.3	2.1	2.1	0	0	2.1	0	0
	Females.....	5.6	51	100	54.9	33.3	7.8	2.0	0	0	2.0	0	0	0
1893-98.	Males.....	5.4	276	100	54.7	33.3	6.9	2.9	1.1	.7	0	.4	0	0
	Females.....	6.3	300	100	50.0	29.3	13.3	4.7	1.7	.3	.3	0	.3	0

TABLE 13.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from Scarlet Fever, in Michigan, during the year 1898, and the averages for the 6 years, 1893-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of non-fatal cases, years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period of age.											
				All ages.	Under 5 years	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Males.....	8.0	724	100	26.2	45.7	19.3	4.4	1.9	.6	.1	1.1	.3	.1	.1
	Females..	8.7	780	100	26.7	42.7	18.2	4.9	3.1	2.2	1.2	.9	.1	0	.1
1893-98.	Males.....	7.8	5,614	100	29.9	42.7	18.0	5.0	1.9	1.0	.6	.5	.2	.1	.1
	Females..	8.7	6,684	100	24.8	42.6	20.0	6.3	2.6	1.5	1.0	.7	.2	.1	.1

AVERAGE DURATION OF SCARLET FEVER. FATAL AND NON-FATAL CASES.

TABLE 14.—*Exhibiting, by sex of patient, by per cent of cases which died in specified periods of time, the duration (in days) of fatal cases of sickness from Scarlet Fever, in Michigan, during the year 1898, and the averages for the 6 years, 1893-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of Scarlet Fever.														
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.											
			All periods.	0 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 days and over.
1898.	Males.....	40	100	40.0	25.0	22.5	2.5	2.5	2.5	5.0	0	0	0	0
	Females.....	28	100	53.6	17.9	17.9	7.1	0	0	3.6	0	0	0	0
1893-98.	Males.....	195	100	38.5	25.1	14.9	5.1	6.7	2.6	2.6	1.5	1.0	0	2.1
	Females.....	214	100	44.9	22.0	15.0	6.5	5.1	1.9	1.9	.5	1.9	0	.5

The average duration of fatal cases of scarlet fever for the year 1898 was 9.4 days for males and 7.9 days for females. For the six years, 1893-98 the average duration was 11.3 days for males and 9.8 for females.

TABLE 15.—*Exhibiting by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from Scarlet Fever in Michigan, during the year 1898, and the averages for the 6 years 1893-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of Scarlet Fever.														
Year.	Sex.	No. of cases in- cluded.	Duration of sickness:—Per cent of non-fatal cases in each period of days.											
			All periods.	0 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	Over 50 days.
1898.	Males.	603	100	2.8	14.6	16.9	15.9	19.6	14.9	7.5	2.5	2.8	2.0	.5
	Females. . .	623	100	2.4	14.0	14.6	20.9	18.5	15.7	7.4	2.6	2.1	1.3	.6
1893-98.	Males.	3,391	100	3.7	19.3	21.7	17.0	14.7	10.0	5.7	3.3	2.5	1.3	.8
	Females. . .	3,934	100	3.4	18.4	22.3	17.5	14.6	10.7	6.1	3.1	2.4	.7	.9

RÖTHELN (GERMAN MEASLES) IN MICHIGAN IN 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health ten outbreaks of rōtheln in ten localities, resulting in 106 cases. From two localities the health officers reported "several" cases. The following is the report of the health officer of Battle Creek in regard to this disease in that city:

"At present we have prevailing an epidemic of German measles. It is a disease of itself and quite distinct from measles and scarlet fever, though presenting many of the clinical features of both diseases. Persons who have had both scarlet fever and measles are susceptible to the contagion of rōtheln. One is no protection from the other. The patients are usually sick from two to four days, but seldom ill enough to be confined to their bed. In this epidemic the skin rash partakes more of the nature of scarlet fever than usually characterizes this disease; so much so that some of the cases have been mistaken at the outset for that malady, but subsequent observations of several of these doubtful cases have convinced me that the contagium is that of German measles."

The main reason for efforts for the restriction of rōtheln is the fact that scarlet fever is so often mistaken for rōtheln, so that in restricting what is apparently rōtheln a more fatal disease is sometimes restricted.

In all cases the public health should be given the benefit of any doubt, and precaution taken against the spread of any contagious disease which may prove to be dangerous.

TYPHOID FEVER IN MICHIGAN.—DURING THE YEAR ENDING DECEMBER 31, 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health 790 outbreaks of typhoid fever (includes "typho-malarial") in 632 localities in Michigan in which there were reported to have occurred 2,874 cases and 634 deaths. Notwithstanding the marked improvement which the State Board of Health has succeeded in bringing about both in promptness and accuracy of reports of local health officials to the central office, it is still probable that not all cases of sickness and deaths from typhoid fever are yet reported.

Definition of the term "outbreak," as used in this article.

For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area.

TABLE 1.—TYPHOID FEVER.—*Exhibiting the numbers of outbreaks, localities, cases and deaths reported for the year 1898; also for the years 1886-98 the average reported outbreaks, localities, cases and deaths, and the average cases and deaths per outbreak, the deaths to 100 cases, and the number of special final reports received.*

Year.	Outbreaks reported.	Localities reported.	Cases reported.	Deaths reported.	Average cases per outbreak.	Average deaths per outbreak.	Deaths per 100 cases.	Final reports receiv'd.
1898-----	790	632	2,874	634	3.64	.80	24	601
Averages. 1886-98..	518	461	2,707	466	5.23	.90	17	250

Typhoid fever in 1898, compared with previous years.

Comparisons with previous years, to ascertain the comparative increase or decrease of the prevalence of typhoid fever in this State, are interesting and instructive, and they would be more so if there existed a fixed basis on which to found such comparisons; but from year to year there has been a steady improvement, both in the methods adopted by the State

TABLE 2.—*Numbers of cases and deaths reported from Typhoid fever, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, clerks, etc.)*

State and counties.	Population of Michigan 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Population of Michigan 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State	2,389,393	2,874	634	12.03	2.65	Keweenaw..	2,851	2	0	7.00	0
						Lake.....	5,289	9	0	17.02	0
Alcona.....	5,427	8	1	14.74	1.84	Lapeer.....	28,545	29	4	10.16	1.40
Alger.....	1,532	6	0	39.16	0	Leelanau...	10,967	2	1	1.82	.91
Allegan.....	39,417	20	6	5.07	1.52	Lenawee....	48,634	43	11	8.84	2.26
Alpena.....	19,853	8	3	4.03	1.51	Livingston..	20,016	23	8	11.49	4.00
Antrim.....	14,442	9	4	6.23	2.77	Luce.....	2,241	0	0	0	0
Arenac.....	8,203	9	3	10.97	3.66	Mackinac...	6,644	2	0	3.01	0
Baraga.....	5,428	0	0	0	0	Macomb.....	33,961	33	13	9.72	3.83
Barry.....	23,615	20	3	8.47	1.27	Manistee...	27,998	31	5	11.07	1.79
Bay.....	66,196	47	13	7.10	1.96	Marquette...	39,936	48	10	12.02	2.50
Benzie.....	10,889	15	4	13.78	3.67	Mason.....	20,459	7	3	3.42	1.47
Berrien.....	49,985	47	8	9.40	1.60	Mecosta.....	21,761	32	6	14.71	2.76
Branch.....	25,623	36	10	14.05	3.90	Menominee...	24,947	4	3	1.60	1.20
Calhoun.....	51,443	155	22	30.12	4.28	Midland.....	15,779	31	11	19.65	6.97
Cass.....	21,399	35	8	16.36	3.74	Missaukee...	8,862	14	3	15.60	3.39
Charlevoix...	12,322	9	1	7.30	.81	Monroe.....	34,025	36	12	10.58	3.53
Cheboygan...	15,814	8	1	5.06	.63	Montcalm...	35,679	30	12	8.41	3.36
Chippewa...	18,625	22	4	11.81	2.15	Montmorency	3,389	7	1	20.66	2.95
Clare.....	8,394	1	1	1.19	1.19	Muskegon...	34,635	38	14	10.97	4.04
Clinton.....	26,015	36	8	13.84	3.08	Newaygo....	17,774	18	6	10.13	3.38
Crawford...	2,458	0	0	0	0	Oakland.....	44,107	29	10	6.57	2.27
Delta.....	23,194	53	9	22.85	3.88	Oceana.....	17,500	51	7	29.14	4.00
Dickinson...	15,448	16	5	10.36	3.23	Ogemaw.....	5,693	1	0	1.76	0
Eaton.....	33,142	18	5	5.43	1.51	Ontonagon...	9,990	21	3	21.02	3.00
Emmet.....	12,638	10	5	7.91	3.96	Osceola.....	18,320	10	4	5.46	2.18
Genesee.....	41,676	18	5	4.32	1.20	Oscoda.....	1,708	0	0	0	0
Gladwin.....	5,592	9	0	16.09	0	Otsego.....	5,316	17	4	31.98	7.52
Gogebic.....	15,000	21	2	14.00	1.33	Ottawa.....	42,868	22	7	5.14	1.64
Gd.Traverse	21,675	12	4	5.54	1.85	Presque Isle.	7,135	0	0	0	0
Gratiot.....	28,884	39	12	13.50	4.15	Roscommon...	1,281	0	0	0	0
Hillsdale...	29,884	24	4	8.03	1.34	Saginaw.....	81,421	33	19	4.05	2.33
Houghton...	52,961	40	9	7.55	1.70	Sanilac.....	35,301	66	14	18.70	3.97
Huron.....	35,967	17	5	4.73	1.39	Schoolcraft.	8,436	0	0	0	0
Ingham.....	41,712	123	21	29.19	5.03	Shiawassee...	34,756	23	7	6.62	2.01
Ionia.....	36,839	24	10	6.51	2.71	St. Clair....	56,537	373	23	65.97	4.07
Iosco.....	4,456	3	2	3.17	2.12	St. Joseph...	24,818	22	8	8.86	3.22
Iron.....	5,561	2	0	3.60	0	Tuscola.....	36,316	31	11	8.54	3.03
Isabella.....	24,094	31	6	12.86	2.49	Van Buren...	31,577	41	14	12.98	4.43
Jackson.....	48,039	61	6	12.69	1.25	Washtenaw..	44,808	49	10	10.94	2.23
Kalamazoo...	44,839	68	9	15.17	2.01	Wayne.....	327,808	322	105	9.82	3.20
Kalkaska...	6,120	9	1	14.71	1.63	Wexford.....	16,816	26	7	15.46	4.16
Kent.....	133,954	209	38	15.60	2.83						

* Population estimated by average annual increase (arithmetical method), based on U. S. census of 1890 and the State Census of 1894. Computed in the office of the State Board of Health.

Board of Health in securing and compiling reports, and in the efforts made by the local health officials throughout the State, to furnish in their reports the information desired by the State Board. It is, therefore, still impossible to determine the exact increase or decrease of prevalence of the disease in this State by comparisons of the numbers of outbreaks of the disease, and the cases and deaths reported to this office year by year.

The facts exhibited in Table 1, show that the reported outbreaks, cases of sickness, and deaths from typhoid fever in 1898, exceed the averages for the thirteen years, 1886-98; also that the numbers of deaths per 100 cases and the final reports received relative to typhoid fever were *more*, and that the cases and deaths per outbreak were *less* than the averages for the years 1886-98.

Sickness rates from reported typhoid fever in 1898.

While it is probable that the reporting of cases of sickness from typhoid fever is not as complete as the reporting of deaths from that disease, yet comparisons may be made, subject to a mental reservation that not all cases are reported, and that it is probable that the omissions are greater in some parts of the State than in others.

Table 2 shows that the sickness-rate from typhoid fever for the State in 1898 was 12.03 cases per 10,000 of population. The county having the greatest reported sickness-rate (65.97) per 10,000 inhabitants, was St. Clair; and the lowest (where sickness occurred) was in Cheboygan County where the rate was 1.19 cases per 10,000 of population.

Death-rates from reported typhoid fever in 1898.

Table 2 shows that the death-rate from reported typhoid fever in 1898, for the State, was 2.65 per 10,000 of population. The county having the highest death-rate (7.52) was Otsego; and that having the lowest (where deaths occurred), .63 of one death per 10,000 of population, was Cheboygan.

TYPHOID FEVER IN EACH MONTH OF THE YEAR 1898.

TABLE 3.—*Exhibiting the number of outbreaks of Typhoid Fever reported to have begun, to have ended, and to have been present, in each month of the year 1898, in Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Outbreaks began..	37	27	21	17	25	28	46	129	136	83	50	24	623
Outbreaks ended..	16	32	27	28	26	27	17	42	84	140	112	92	643
Outbreaks present	40	65	65	60	63	68	87	209	306	309	230	146	790

The last line in Table 3 shows the number of outbreaks present in each month of the year. As many outbreaks lasted more than one month they are counted in each month of their duration; consequently the sum of the outbreaks present in the several months exceeds the total number of reported outbreaks.

TABLE 4.—*Exhibiting the number and per cent of cases of Typhoid Fever in Michigan in each month during the year 1898. (Includes each case for which the time during which it existed, was stated in the reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases sick in any part of the month...	86	133	138	139	129	112	148	377	675	724	495	272
Per cent the cases sick in each month were of total reported cases.....	3	5	5	5	4	4	5	13	23	25	17	9

The first line of figures in Table 4 shows the number of cases reported sick in any part of each month. As some of the cases were sick longer than one month, they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total of reported cases in 1898; and as the last line of figures in this table shows the per cent the cases sick in each month were of the exact number of cases *reported* to this office in 1898, the sum of the figures in the last line of the table exceeds 100.

Source of contagium of typhoid fever.

Of the 2,874 reported cases of typhoid fever in 1898, the local health officers stated the source of contagium to be as follows:

Traced to former cases, 142; attributed to infected, contaminated, or surface water, 920; cases reported as coming from outside jurisdictions, 328; attributed to filthy or unsanitary conditions, 34; contaminated milk or food supply, 12; cases, the sources of contagium of which were reported as unknown, 723; cases, the source of contagium of which were not reported, or the statements were too indefinite for classification, 715; total, 2,874.

TABLE 5.—*First, second and third localities, where the second locality was infected with Typhoid Fever from the first, and the third was infected from the second; and the numbers of cases and deaths from Typhoid Fever in the first, second and third localities with the dates of the beginning and ending of each outbreak. (Compiled from reports of health officers who were able to trace the source of contagium to other localities.)*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Allegan county.....	---	---	Cass county: Volinia township.....	4	0			
			(Aug. 8-Sept.)					
Antrim county: Bellaire village.....	5	2	Gr'd Traverse county: Traverse City.....	1	0			
(Aug. 4 —)			(Nov. 15-Dec. 1.)					
Antrim county: Central Lake township	*	---	Antrim county: Banks township.....	3	1			
			(Sept.-Oct. 30.)					
Arenac county: Turner township.....	1	0	Arenac county: Mason township.....	3	2			
(Oct. 8-Oct. 26.)			(Aug. 23-Oct. 21.)					
Bay county: Bay City.....	20	4	Huron county: Bingham township....	3	0			
(Aug.-Dec.)			(Aug. 15-Oct. 17.)			Livingston county: Iosco township.....	1	0
			Jackson county: Jackson city.....	2	0	(Aug. 11-Sept. 8.)		
			(Aug. Sept. 9.)			Pinckney village.....	1	1
Bay City.....			Shiawassee county: Vernon village.....	1	0	(Sept. 23-Oct. 17.)		
			(Oct. 12-Nov. 14.)					
Bay county: Garfield township.....	*	---	Bay county: Beaver township.....	4	2			
			(Oct. 15-Nov. 4.)					
			Midland county: Mills township.....	7	0			
			(Aug. 16-Feb., 1899.)					
Berrien county: Niles city.....	2	1	Berrien county: Niles township.....	1	0			
(Feb. --)			(Feb. 3-Feb. 25.)					
Berrien county: Sodus township.....	*	---	Berrien county: Berrien township.....	4	0			
			(Aug. 6-Nov. 11.)					
			Pipestone township. (Aug. 6-Oct. 2.)	4	1			
Berrien county: Three Oaks.....	*	---	Berrien county: Weesaw township....	2	0			
			(Aug. 11 —)					
			Barry county: Assyria township.....	1	0			
			(Oct. 5-Nov. 12.)					
Calhoun county: Battle Creek city.....	100	13	Calhoun county: Athens township.....	1	0			
(Aug. 11-Dec. 13.)			(Dec. 5-Dec. 26.)					
			Leroy township.....	6	1			
			(Aug. — Feb. 3, 1899.)					
			Marshall township....	2	1			
			(Oct. 2-Nov. 12.)					
			Kalamazoo county: Climax township.....	1	1			
			(Sept. 10-Oct. 21.)					

*Typhoid fever was not reported to this office by the health officer of the "first" locality at the time it was said to have spread from there; showing that the disease, if present, was neglected; probably it was not reported to the health officer as the law requires.

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Calhoun county: Lee township	2	0	Calhoun county: Marengo township....	1	0			
Emmet county: Cross Village township	*	—	Emmet county: Petoskey city..... (Nov. 28-May, 1899.)	4	2			
Emmet county: Petoskey city..... (May 4-Nov. 12.)	6	3	Kalkaska county: Kalkaska village. (July 10-Aug. 20.)	1	0			
Grand Traverse county: Long Lake township....	*	—	Clinton county: Ovid village..... (Oct. 1-Oct. 31.)	1	0			
Gratiot county.....			Huron county: Chandler township... (Nov. 3-Jan. 8, 1899.)	1	0			
			Shiawassee county: Woodhull township... (Aug. 20-Dec. 1.)	3	0			
Houghton county: Calumet township..... (Aug.-Feb., 1899.)	19	4	Houghton county: Franklin township.... (Nov. 14-Dec. 20.)	1	0			
			Marquette county: Marquette city..... (Aug. 20-Nov. 15.)	7	0			
Huron county: Huron township.....	*	—	Huron county: Port Austin township (Dec. 30-Feb. 27, 1899.)	1	0			
Ingham county: Bunker Hill..... (Jan. 28-June 1.)	6	0	Ingham county: Stockbridge township (Mar. 4-Apr. 1.)	1	0			
Ingham county: Delhi township..... (Sept. —)	3	2	Eaton county: Windsor township.... (Sept.-Oct. 28.)	3	2			
Ingham county: Lansing city..... (Jan.-Dec.)	58	5	Jackson county: Jackson city..... (Sept. 3-Sept. 24.)	1	0			
Ingham county: White Oak township... (July 13-Oct. 17.)	9	3	Ingham county: Le Roy township..... (Sept. 1-Nov. 21.)	8	4			
Ingham county: Williamston village....	1	0	Ingham county: Lock township..... (Sept. 24-Oct. 24.)	1	0			
Ionia county: Ionia city.....	*	—	Wexford county: Cadillac city..... (Nov. 14-Dec.)	1	0			
Ionia county: Keen township..... (Aug. 25-Dec. 8.)	4	1	Ionia county: Belding city..... (Nov. 15-Dec. 28.)	1	0			
Ingham county: Portland village..... (Aug. 16-Aug. 21.)	1	1	Ingham county: Leslie village..... (— Apr. 24.)	1	1			
			Montcalm county: Crystal township..... (Aug. 1-Aug. 31.)	1	1			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Isabella county.....			Midland county: Mills township..... (Oct. 23-Feb., 1899.)	3	0			
Kalamazoo county: Kalamazoo city..... (Jan.-Dec.)	48	5	{ Kalamazoo county: Vicksburg village..... (Aug. 10-Sept. 1.) Pavilion township..... (Aug.-Aug.)	1	0			
			{ Clinton county: Westphalia village... (Sept.-Oct. 5.)	1	1			
Kent county: Grand Rapids city..... (Jan.-Dec.)	173	30	{ Ottawa county: Holland township.... (July 11-July 19.)	1	1			
			{ St. Joseph county: Constantine village... (Dec. 25-Jan. 20, 1899.) Sturgis city..... (Nov. 5-Dec. 22.)	1	1			
Kent county: Grattan township..... (May 15-Dec. 29.)	2	0	{ Ionia county: Belding city..... (Sept. 25-Nov. 25.)	1	1			
Kent county: Plainfield township.....	2	1	{ Ottawa county: Wright township.... (Jan. 28-Aug. 22.)	1	1			
			{ Bay county: Merritt township.... (Dec. 12-Dec. 28.)	1	1			
Lapeer county: Attica village..... (Oct. 16-Dec. 2.)	1	0	{ Tuscola county: Denmark township... (Nov. 21-Dec. 4.)	3	0			
Lenawee county: Rollin township..... (Aug. 15-Dec. 10.)	3	0	{ Hillsdale county: Wright township..... (Oct. 10-Feb. 20, 1899.)	4	0			
			{ Barry county: Baltimore township.. (Sept. 3-Oct. 2.) Middleville village... (Aug. 27-Sept. 21.)	1	0			
			{ Calhoun county: Marshall city..... (Sept. 17-Oct. 13.)	1	0			
			{ Eaton county: Charlotte city..... Chester township....	2	0			
Livingston county: (Green Oak township) Island Lake.....			{ Gratiot county: Arcada township.... (Sept. 3-Oct. 1.) Hillsdale county: Allen township.....	1	0			
			{ Ingham county: Ingham township..... (June-May 6, 1899.)	17	2	Ingham county: White Oak township (July 13-Oct. 17.)	9	3
			{ Livingston county: Brighton township.... (Aug. 19-Sept. 5.) Green Oak township..	1	0			
				6	1			

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Livingston county: (Green Oak township.) Island Lake.....			Oakland county: Oxford village..... (Sept. 12—)	1	0			
			Oceana county: Benona township..... (Sept. 15—)	1	0			
			Hart township..... (Aug. 31—)	1	0			
			Pentwater village..... (Aug. 9 Sept. 30.)	1	0			
Livingston county: Island Lake.....			St. Joseph county: Three Rivers city..... (July 15-July 27.)	1	0			
Livingston county: Howell township..... (June-Nov.)	4	2	Livingston county: Cohoctah township..... (June 19-July 25.)	1	0			
			Fowlerville village..... (June 27-Aug. 21.)	2	0			
Livingston county: Howell village..... (Oct. 5-Nov. 24.)	1	1	Livingston county: Geneva township..... (Oct. 30-Dec. 20.)	1	0			
Macomb county: Mt. Clemens city.....	5	4	Macomb county: Ray township.....	8	2			
			Richmond township.....	1	0			
Manistee county: Manistee city.....	2	2	Kalamazoo county: Kalamazoo city..... (June 27. —)	1	0			
Mecosta county: Big Rapids city..... (July 6-Jan. 15, 1899.)	19	5	Clinton county: Essex township..... (Oct.-Nov. 5.)	1	1			
Mecosta county: Remus village.....	*		Newaygo county: Barton township..... (July 3-Aug. 27.)	1	0			
Monroe county: Monroe township..... (— Aug. 21.)	1	1	Lenawee county: Deerfield village..... (Aug. 14-Aug. 20.)	1	1	Lenawee county: Adrian city..... (Jan. 10-Oct. 1.)	8	3
Monroe county: Whiteford township...	*		Monroe county: Erie township..... (Sept. 20 Dec. 8.)	3	0			
Montcalm county: Howard City.....	*		Macomb county: Richmond township..... (Aug. 15-Nov. 3.)	3	0			
Oakland county: Oxford village..... (— Oct. 29.)	4	2	Lapeer county: Metamora township..... (Oct. 10-Nov. 11.)	1	0			
Oakland county: Pontiac city..... (Sept.-Dec.)	3	2	Lapeer county: Metamora township..... (Sept. — Oct. 15.)	1	0			
Oceana county: Hart township..... (— Dec.)	3	1	Oceana county: Benona township..... (Jan.-Mar.)	1	0			
Ontonagon county.....			Houghton county: Laird township..... (Aug. 8-Sept. 10.)	1	0			

* This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Presque Isle county: Onaway village.....	*	---	Cheboygan county: Waverly township.... (Aug. 4-Oct. 30.)	3	0	Lapeer county: Arcadia township....	1	0
Saginaw county: Freemont township.... (Oct. 9-Feb. 25, 1899.)	10	2	Saginaw county: Swan Creek township (Dec. 17-Dec. 30.)	1	0			
Sanilac county: Washington township.. (Nov. 2-Dec. 21.)	4	0	Sanilac county: Watertown township (Dec. 5-Dec. 20.)	2	1			
Shiawassee county.....	---	---	Sanilac county: Greenleaf township.. (Dec. 19-Jan. 21, 1899.)	2	0			
Shiawassee county: Owosso city.....	1	1	Shiawassee county: New Haven township (June 8-June 24.)	1	0			
St. Clair county: Capac.....	*	---	Washtenaw county: Ann Arbor city..... (Aug. 16-Oct. 1.)	1	0			
St. Clair county: Columbus township....	5	1	St. Clair county: Casco township.....	2	0			
St. Clair county: Marine City..... (Mar. 4-July.)	15	4	St. Clair county: Casco township..... (Apr. 8-Apr. 29.)	1	0			
St. Clair county: St. Clair city..... (Jan. —.)	300	8	Macomb county: Lenox township..... (Mar. 9-Apr. 12.)	1	0			
Van Buren county: Covert township..... (Feb. 27-Nov. 10.)	7	2	St. Clair county: China township..... (Feb. 9-Mar. 3.)	1	1			
Van Buren county: Lawton village.....	---	---	Cass county: Howard township.... (Sept. 19-Dec. 15)	4	1			
Washtenaw county: Ann Arbor city.....	13	2	Cass county: Wayne township.... (Oct.-Nov.)	1	0			
Wayne county: Detroit..... (Jan.-Dec.)	87	68	Livingston county: Hamburg township... (July 15-Aug. 10.)	1	0			
Wayne county: Ecorse township..... (Jan.-Dec.)	123	11	Oakland county: Troy township..... (July 20-Aug. 12.)	3	0			
Wayne county: Huron township.....	*	---	Shiawassee county: Owosso city..... (— Sept. 22.)	1	1			
			Wayne county: Springwells township (Aug. 1-Dec. 31.)	5	4			
			Wayne village..... (Oct. 15-Nov. 20.)	1	0			
			Macomb county: Chesterfield township (Sept.-Dec.)	3	1			

* This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Wayne county: Wyandotte city..... (Jan.-Dec.)	52	7	{ Monroe county: Berlin township..... (Apr. 18-Aug. 21.)	3	2			
			{ Wayne county: Brownstown township (July 17-Aug. 31.)	1	1			
			{ Sumpter township.... (Oct. 1-Oct. 13.)	1	1			
Wexford county: Liberty township..... (May-Oct. 1.)	6	1	Wexford county: Cedar Creek township (Sept. 9-Oct. 12.)	1	0			
Movement of Infection of Typhoid Fever into Michigan from outside the State.								
Alabama: Huntsville.....			{ Barry county: Hastings City..... (Sept. 21-Nov. 2.)	4	0			
			{ Branch county: Kinderhook township. (Sept. 19-Oct. 18.)	1	0			
			{ Ottawa county: Holland city..... (Sept. 24-Nov.)	1	0			
California.....			{ Ingham county: Stockbridge village.. (Mar. 1-Mar. 25.)	1	0			
Canada.....			{ Cass county: Newberg township... (Dec. 26-Jan. 9, 1899)	1	1			
Colorado.....			{ Ionia county: Ionia township..... (Aug. 1-Oct. 1.)	1	0			
			{ Allegan county: Gun Plain township... (Aug. 14-Oct. 1.)	1	1			
			{ Calhoun county: Le Roy township..... (Aug. 29-Sept. 29.)	1	0			
			{ Genesee county: Flint city..... (— Oct. 28.)	5	1	Sanilac county: Lexington township.. (Nov. 10-Dec. 9.)	1	0
			{ Forest township..... (Sept.-Sept. 18.)	1	1			
			{ Grand Traverse county: Traverse City..... Sept.-Dec. 1.)	6	2			
Cuba.....			{ Mecosta county: Big Rapids city..... (— Nov. 20.)	3	2			
			{ Deerfield township.... (— Nov.)	1	0			
			{ Oakland county: Troy township..... (Oct. 17.—)	1	0			
			{ St. Joseph county: Nottawa township.... (— Sept. 12.)	1	1			
			{ Wayne county: Plymouth village..... (Aug. 13-Oct. 27.)	3	1			

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever into Michigan from outside the State.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Cuba: Santiago.....			Cass county: Penn township..... (Sept. 4-Nov. 8.)	2	1			
			Lenawee county: Deerfield village..... (Sept. 6-Oct. 22.)	1	0			
			Oakland county: Holly village..... (Sept. 1-Sept. 25.)	1	1			
			Troy township..... (Sept. 6-Oct. 12.)	1	0			
			Ottawa county: Holland township..... (Sept. 13-Oct. 30.)	1	0			
Dakota.....			Berrien county: Benton Harbor city... (Oct. 1-Oct. 30.)	1	0			
Florida: Camp Fernandina.....			Oakland county: Royal Oak township.. (Aug. 8-Oct. 18.)	1	0			
Florida: Jacksonville.....			Van Buren county: Paw Paw village.....	1	0			
			Kalamazoo county: Pavilion township..... (Oct. 25-Nov. 5.)	1	0			
Florida: Lakeland.....			Shiawassee county: Morrice village.....	1	1			
			Clinton county: Victor township..... (Aug. 15 Oct. 15.)	2	0			
Florida: Tampa.....			Eaton county: Charlotte city.....	1	0			
			Emmet county: Little Traverse twp... (July 20-Sept. 28.)	1	0			
			Hillsdale county: Litchfield township... (Sept. 29-Oct. 25.)	1	0			
			Lenawee county: Blissfield township.... (Aug. 5-Aug. 29.)	1	1			
			Shiawassee county: Woodhull township.... (Oct. 14-Nov. 6.)	1	0			
Georgia: Camp Thomas.....			Ingham county: Mason city..... (July 22-Sept.)	1	0			
			Lenawee county: Tecumseh village..... Aug. 21-Sept. 18.)	1	0			
Illinois: Chicago.....			Ionia county: Lake Odessa village.. (Nov. 10-Nov. 24.)	1	1			

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever into Michigan from outside the State.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Illinois: Chicago.....			Jackson county: Jackson city..... (July 25-July 27.)	1	1			
			Lenawee county: Hudson city..... (Nov. 1-Dec. 20.)	1	0			
			Shiawassee county: Rush township..... (Mar. 25-May 1.)	1	0			
			Van Buren county: South Haven twp..... (Aug. 16-Sept. 25.)	2	0			
			Washtenaw county: Dexter village..... (Apr. 25-May 26.)	1	0			
			Dexter village..... (Dec. 23-Jan. 4, 1899.)	1	0			
Indiana: Ashley.....			Clinton county: Eagle township..... (Apr. 19-)	1	0			
Indiana: Fremont.....			Hillsdale county: Camden township..... (Mar. 10-May 26.)	2	0			
Indiana: Fort Wayne.....			Cass county: Dowagiac city..... (Sept. 5-Oct. 11.)	3	2			
Indiana: South Bend.....			Cass county: Calvin township..... (Oct. 8-Oct. 23.)	1	0			
Indian Territory: Oklahoma.....			Berrien county: Buchanan township... (Aug. 31-Sept. 18.)	1	1			
Iowa: Muscatine.....			Huron county: Bad Axe village..... (Oct.-Nov. 15.)	1	1			
Long Island: Camp Wikoff.....			Jackson county: Jackson city..... (Sept. 16-Oct. 1.)	1	0			
Ohio.....			Eaton county: Charlotte city..... (— Sept. 24.)	1	1			
			Lenawee county: Clinton village..... (Oct. 1-Oct. 24.)	1	1			
Ohio: Continental.....			Lenawee county: Fairfield township... (Sept. 1-Oct. 1.)	2	0			
Ohio: Painesville.....			Barry county: Nashville village..... (Oct. 10-Oct. 13.)	1	1			
Ohio: Toledo.....			Monroe county: Bedford township..... (Oct. 1-Oct. 17.)	1	1			
			Ida township..... (Aug. 1-Sept. 1.)	1	0			
			La Salle township..... (Sept. 3-Oct. 6.)	2	0			

TABLE 5.—CONTINUED.—*Movement of Infection of Typhoid Fever into Michigan from outside the State.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Ohio: Youngstown.....			Leelanau county: Sutton Bay township. (Apr.-May.)	1	0			
Pennsylvania.....			Ogemaw county: West Branch village.. (Aug. 21—.)	1	0			
Pennsylvania: Camp Mead.....			Osceola county: Reed City village..... (Nov. 11-Nov. 28.)	1	1	Kent county: Sparta township..... (Nov. 13-Dec. 10.)	1	0
			Montcalm county: Fairplains township... (Sept. 4-Sept. 25.)	1	0			
Porto Rico.....			Osceola county: Reed City village..... (Sept. 8-Oct. 24.)	1	1			
Tennessee: Camp Poland.....			Calhoun county: Homer village..... (Sept. 8-Oct. 17.)	1	0			
Tennessee: Chickamauga.....			Eaton county: Charlotte city..... (— Oct.)	1	0			
			Ottawa county: Zeeland village..... (Sept. 28-Oct. 25.)	1	0			
Tennessee: Knoxville.....			Lenawee county: Clinton village..... (Oct.-Dec. 17.)	1	0			
			Van Buren county: Covert township.....	1	0			
Virginia.....			Tuscola county: Cass city village..... (Sept. 28-Oct. 7.)	1	0			
Virginia: Camp Alger.....			Shiawassee county: Bancroft village..... (Sept. 13-Nov. 1.)	1	0			
Wisconsin: Oshkosh.....			Ontonagon county: McMillan township... (Sept. 2 Dec. 10.)	15	1			
On shipboard.....			Alpena county: Alpena city..... (— Sept. 26.)	1	1			
Southern camp.....			Isabella county: Rolland township..... (Sept. 4-Oct. 28.)	6	0			
From the south. (Soldier.)			Ottawa county: Holland city..... (Sept. 14-Dec. 10.)	1	0			
Probable movement of Infection of Typhoid Fever.								
Antrim county: Torch Lake.....	*		Antrim county: Bellaire village..... (Aug. 4—)	5	2			

*This foot-note is printed at the bottom of the first page of this table.

TABLE 5.—CONCLUDED.—*Probable Movement of Infection of Typhoid Fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Bay county: Bay City..... (Aug. 10-Dec.)	20	4	Bay county: Pinconning township. (Oct. 2-Nov. 3.)	1	0			
Calhoun county: Battle Creek city..... (Aug. 11-Dec. 13.)	100	13	Lapeer county: Dryden village..... (Oct. 17-Nov. 17.)	1	0			
Cass county: Ontwa township..... (Jan. 7-Feb. 4.)	1	0	Cass county: Mason township..... (Feb. 12-Mar. 13.)	2	0			
Delta county: Escanaba city..... (Feb.-Oct. 29.)	18	4	Dickinson county: Sagola township..... (Sept. 29-Oct. 10.)	1	1			
Hillsdale county.....			Eaton county: Eaton Rapids city..... (Sept. 25-Oct. 16.)	1	0			
Hillsdale county: Hillsdale city.....	*		Hillsdale county: Pittsford township..... (Nov. 1-Dec. 5.)	1	0			
Jackson county: Parma village..... (Aug. 15-Sept. 30.)	2	0	Jackson county: Parma township..... (Nov. 20-Dec.)	1	0			
Lenawee county: Adrian city..... (Jan. 10-Oct. 1.)	8	3	Lenawee county: Dover township..... (Mar. 1-Mar. 28.)	1	0			
Livingston county: Fowlerville village..... (June 27-Aug. 21.)	2	0	Ingham county: Meridian township..... (Aug. 12-Sept. 25.)	1	0			
Marquette county: Humboldt township.....	*		Marquette county: Michigamme township..... (Sept. 29-Dec. 28.)	3	0			
Muskegon county: Fruitland township..... (Aug. 1-Oct. 4.)	1	0	Muskegon county: Whitehall village..... (Sept. 6-Oct. 6.)	1	0			
Sanilac county.....			St. Clair county: Caseo township..... (Sept. 28-Dec. 10.)	1	0			
St. Clair county: Port Huron city..... (Jan.-Dec.)	17	5	Oakland county: Orion village..... (Aug. 1 Nov. 15.)	2	1			

*This foot-note is printed at the bottom of the first page of this table.

Measures taken to restrict typhoid fever—results.

In studying the effects of efforts of health officers for the restriction and prevention of typhoid fever, and of the difficulties experienced by some of them in carrying out the methods recommended by the State Board of Health to that end, it is interesting to note the difference in the reported numbers of cases of sickness and of deaths from this disease, in outbreaks where local health officers were able to enforce isolation and disinfection, and in those outbreaks in which, for any reason, those restrictive measures were neglected.

By Table 6 it may be seen that in the outbreaks relative to which the reports state that isolation and disinfection were enforced, there occurred 1.62 cases and .40 of one death per outbreak; whereas, in those outbreaks

TABLE 6.—TYPHOID FEVER IN MICHIGAN IN 1898: Exhibiting the numbers and average numbers of cases and deaths per outbreak:—
 (1) in all the 753 outbreaks reported; (2) in the 359 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 13 outbreaks in which disinfection was enforced and isolation was doubtful; (4) in the 36 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 62 outbreaks in which isolation was enforced and disinfection was neglected; (6) in the 16 outbreaks in which disinfection was enforced and isolation was neglected; (7) in the 147 outbreaks in which both isolation and disinfection were neglected; (8) in the 123 outbreaks in which both isolation and disinfection were enforced.

	(1) All outbreaks. (753 outbreaks.)*		(2) Isolation or disinfection or both not mentioned or statements doubtful. (359 outbreaks.)		(3) Disinfection enforced— isolation doubtful. (13 outbreaks.)		(4) Isolation enforced— disinfection doubtful. (36 outbreaks.)		(5) Isolation enforced— disinfection neglected. (62 outbreaks.)		(6) Disinfection enforced— isolation neglected. (16 outbreaks.)		(7) Isolation and disinfection both neglected. (147 outbreaks.)		(8) Isolation and disinfection both enforced. (123 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	2,219	472	1,063	269	21	5	59	15	147	27	26	8	704	99	199	49
Averages	2.97	.63	2.96	.75	1.62	.38	1.64	.42	2.37	.44	1.63	.50	4.79	.67	1.62	.40

* These do not include the cases and deaths in Detroit, Grand Rapids and Kalamazoo because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease was present in some part of the city nearly all the time.

ISOLATION AND DISINFECTION RESTRICT TYPHOID FEVER.

Typhoid fever in Michigan in the years, 1890-98:—exhibiting the average numbers of cases and deaths per outbreak:—in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local Health Officers.)

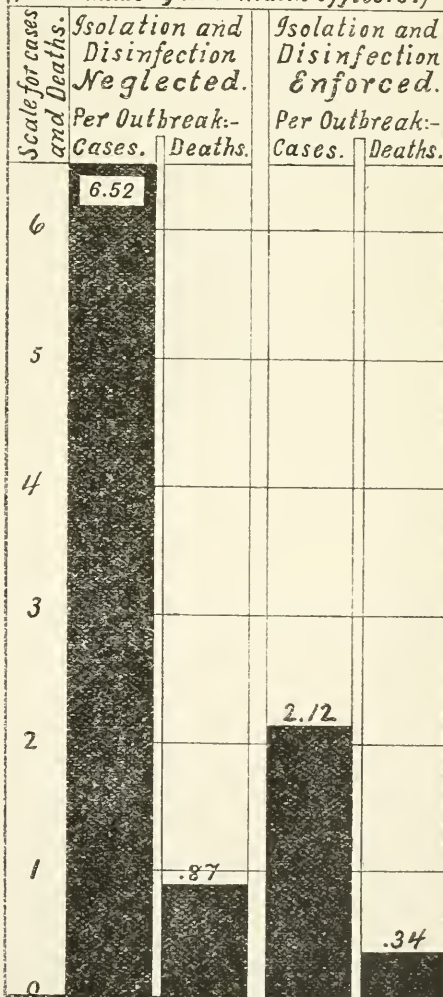


TABLE 7.—TYPHOID FEVER IN MICHIGAN: Exhibiting for the year 1898, and for the nine-year period, 1890-98, the numbers of reported outbreaks, cases and deaths in all outbreaks, and the numbers of outbreaks, cases and deaths for the same year and period of years, relative to which restrictive measures were neglected, and the numbers relative to which those measures were enforced; also the estimated numbers of cases and deaths prevented, in said year and period of years, by isolation and disinfection.

Years.	All outbreaks.*				Isolation and disinfection both neglected.				Isolation and disinfection both enforced.				Cases and deaths indicated as having been prevented by isolation and disinfection.	
	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1898.....	753	2,219	472			704	99	123	199	19	1,287		32	
Totals 1890-98.....	5,273	22,339	3,756			4,873	648	587	1,241	198	14,169		1,173	
Averages, nine years, 1890-98.....	586	2,482	117			541	72	65	138	22	1,574		130	
Average cases and deaths per outbreak, 9 years, 1890-98.....						6.52	.87		2.12	.34				

* These do not include the cases and deaths in Detroit. Grand Rapids and Kalamazoo, because of the difficulty in determining the beginning and ending of an outbreak in these localities, in which the disease was present in some part of the city nearly all the time.

TABLE 15.—Exhibiting the number of inches above the ground water in Lansing, by months, for the year 1898, compared with the per cent of reported cases and outbreaks of Typhoid Fever in Michigan, for each month of 1898; also average per cents of cases and outbreaks for the 12 years 1887-98 and the total numbers of cases and outbreaks included in this table. (Compiled from those cases of which the date of occurrence was given; and for those outbreaks of which the time of beginning was stated.)

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	No. of cases and out-breaks included in this table.
Inches of earth above the water, year 1898	311	306	302	297	300	300	306	306	300	313	311	314	
Per cent of cases of typhoid fever reported, year 1898	100	4	4	4	3	3	5	14	22	20	11	5	
Per cent of outbreaks which began in each month, 1898	100	6	3	3	4	4	7	21	22	13	8	4	
Inches of earth above the water, Av. 1887-98	306	306	303	301	300	298	290	300	303	305	307	307	
Per cent of cases of typhoid fever reported, Av. 1887-98	100	4	3	3	3	3	6	14	21	20	14	8	24,836
Per cent of outbreaks which began in each month, Av. 1887-98	100	6	3	3	4	5	9	19	19	16	8	5	5,448

in which isolation and disinfection were neglected there were 4.79 cases and .67 of one death per outbreak, or nearly three times as many cases and more than one-half more deaths in outbreaks in which isolation and disinfection were neglected than there were in those outbreaks in which the restrictive measures were enforced.

An examination of Table 6 shows that there were 359 outbreaks where isolation and disinfection were doubtful, and that the number of cases to the outbreak was less than in those outbreaks in which isolation and disinfection were neglected, and greater than in those where isolation and disinfection were enforced.

In the compilation of the reports for Tables 6 and 7 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

Table 7 indicates that in 1898 there was a saving of 1,287 cases and 32 lives through isolation and disinfection.

In the nine years, 1890-98, in those outbreaks in which isolation and disinfection were neglected the average number of cases per outbreak

AVERAGE DURATION OF TYPHOID FEVER.—FATAL AND NON-FATAL CASES.

TABLE 8.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from Typhoid Fever in Michigan, during the year 1898, and averages for the 12 years, 1887-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of typhoid fever.														
Year.	Sex.	No. of cases in- cluded.	Duration of sickness:—Per cent of deaths in each period of days.											
			All cases.	Un- der 11 days.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1898.	Males	241	100	17	22	13	17	11	7	2	3	2	.8	5
	Females	157	100	19	20	17	19	10	4	1	4	1	1	3
Av. 1887- 1898.	Males	96	100	20	16	16	16	11	6	4	3	3	1	4
	Females	70	100	23	22	15	12	10	6	4	4	1	2	3

was 6.52 and the average number of deaths .87 of one death; and in those outbreaks, in this period of years, in which restrictive measures were enforced, the average number of cases per outbreak was 2.12 and the average number of deaths per outbreak was .34 of one death. Diagram—Plate 1026—on a subsequent page, graphically illustrates this difference.

Of the 1,245 males and 907 females who were reported to have died from typhoid fever within the twelve years, 1887-98, and of which the interval between the day of being taken sick and the day of death was given, 20 per cent of males and 23 per cent of females died before the tenth day of sickness; 16 per cent of males and 22 per cent of females died after ten to fifteen days of sickness. Sixty-eight per cent of males and 72 per cent of females died before the twenty-fifth day of sickness.

The average duration of fatal cases of typhoid fever in 1898 was 22.7 days for males and 20.5 days for females.

TABLE 9.—*Exhibiting, by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from Typhoid Fever, in Michigan, during the year 1898, and the averages for the 12 years, 1887-98 (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of typhoid fever.														
Year.	Sex.	No. of cases in- cluded.	Duration of sickness:—Per cent of cases in each period of days.											
			All peri- ods.	Un- der 11 days.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1898.	Males.	448	100	1	6	8	21	14	15	10	8	6	2	8
	Females.	362	100	2	7	12	22	9	15	11	6	4	3	8
Av. 1887-98.	Males.	377	100	2	6	8	15	18	14	11	9	6	3	9
	Females.	275	100	2	6	9	16	16	14	12	7	4	4	9

AGE OF OCCURRENCE OF TYPHOID FEVER.

TABLE 10.—*Exhibiting, by sex, the per cent of persons in certain age-groups sick from Typhoid Fever in Michigan, during the year 1898, and the average for the 12 years 1887-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of persons sick, years.	No. of cases included.	Age.—In periods of years.—Per cent of cases in each period of age.										
				All ages.	Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Males.....	25	689	100	7	11	10	20	13	12	7	7	5	9
	Females.....	24	519	100	8	11	13	21	9	12	8	6	3	9
Av. 1887-98.	Males.....	23	678	100	14	12	14	21	14	9	6	4	3	4
	Females.....	21	510	100	17	16	19	14	9	7	5	4	3	5

In Table 9 it may be noticed that in *non-fatal* cases of typhoid fever for the twelve years, 1887-98, 63 per cent of the males and 63 per cent of the females recovered before the thirty-fifth day of sickness. The average duration of non-fatal cases in 1898 was, in males 32, and in females 31.4 days.

The average duration of cases of typhoid fever in 1898, fatal and non-fatal, was 27.4 days for males, 26 days for females, and 26.7 days for both sexes.

TABLE 11.—*Exhibiting, by sex, the per cent of persons in certain age-groups who died of Typhoid Fever during the year 1898; also for the years 1892-98, the per cent the deaths in each group were of all the deaths from Typhoid Fever.*

Year.	Sex.	Average age of decedents, years.	No. of deaths included.	Per cent of deaths in certain age-groups.*										
				All ages	Under 10 years	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Males	27	367	100	17	22	13	17	11	7	2	3	2	6
	Females ..	27	192	100	19	20	17	19	10	4	1	4	1	4
1892-98.	Percent the deaths in each age-group were of all the deaths.....	-----	1,952	100	10	11	16	18	13	8	7	4	3	9

* In each age-group both years are included.

Table 10 shows that of the 689 males and 519 females who were sick with typhoid fever in 1898, and of whom the ages were reported, the greatest per cent of each sex were of ages between twenty and twenty-four years.

Table 11 shows that of the 367 males and 192 females who died of typhoid fever in 1898, 22 per cent of the males and 20 per cent of the females were of ages between ten and fourteen years; and that 80 per

TABLE 12.—*Exhibiting by sex, the number of persons in certain age-groups who died of Typhoid Fever during the year 1898; also by age-groups, the number of deaths in the seven years, 1892-98, per 10,000 inhabitants.*

Year.	Sex.	Average age of decedents, years.	No. of deaths included.	Number of deaths in certain age-groups.*									
				Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1898.	Males	27	367	31	28	42	85	54	33	25	14	21	34
	Females ..	27	192	25	31	23	25	17	12	16	8	8	27
1892-98.	Males.....	Deaths per 10,000 inhabitants, of the same sex, and age, in each age-group.		.54	1.06	1.96	3.34	2.59	1.73	1.46	1.01	1.13	.81
	Females..			.52	1.47	1.96	1.35	1.30	.97	1.11	.89	.56	.74
1892-98.	The average number of deaths (both sexes) per 10,000 inhabitants in each age-group for the seven years, 1892-98.....			.53	1.26	1.96	2.34	1.96	1.37	1.30	.96	.87	.77

*In each age-group both years are included.

cent of the males and 85 per cent of the females were under thirty years of age.

Table 11 shows also that the greatest per cent of decedents of both sexes in the seven years 1892-98 died at ages between twenty and twenty-four years.

In studying Tables 10 and 11, and first two lines in Table 12, relative to age of persons who died with or who had typhoid fever, it should be held in mind that there are more persons living in the earlier ages than at the more advanced ages. In the last three lines of Table 12, this fact is taken account of, and they exhibit the relative danger of death at each period of life, according to the experience in Michigan in the seven years 1892-8.

By Table 12 it may be seen, that to males the greater danger of death from typhoid fever was in the age-periods 15 to 29 years, especially in the period 20 to 24 years; the greatest death-rate of females was during the age-period 15 to 19 years.

Two lines of evidence of the prevalence of typhoid fever.

In studying the prevalence of typhoid fever in 1898, from the facts presented in the preceding and following pages, it must be borne in mind that those facts are derived from two distinct sources of information:

1.—The numbers of outbreaks, of cases of sickness, and of deaths from typhoid fever are taken from special reports from health officers and other township, city and village officers, during the course of an outbreak, at its close, or in annual reports at the close of the year. If all the people and officers reported as the law provides, the facts presented would represent the *actual numbers* of outbreaks, cases of sickness, and deaths from typhoid fever which occurred in the State during the year; but *all* do not so report. It is just, however, to state that as the people generally are becoming better instructed in the measures recommended by the State Board of Health for the saving of life and health, better and more complete reports are made year by year. So, each year, we believe that an increasing proportion of the cases of sickness and deaths from the dangerous communicable diseases are reported to this office. This tends toward an apparent increase in the prevalence of the disease each year, modified, of course, by the real fluctuation in prevalence. While waiting for perfect reports, the facts derived from those now received are valuable for purposes of study.

TABLE 13.—*For the year 1898, and an average for the 12 years 1886-97, the per cent of reports (from regular correspondents to the State Board of Health, and others) stating the presence of Typhoid Fever in Michigan; also, for the same year and period of years, the average number of outbreaks, number of localities of outbreaks, the cases of sickness and the deaths reported from typhoid fever.*

Years.	Per cent of weekly postal reports stating the presence of typhoid fever.	Reported outbreaks of typhoid fever.	Reported localities of outbreaks of typhoid fever.	Reported cases of sickness from typhoid fever.	Reported deaths from typhoid fever.
1898.....	8	790	632	2,874	634
Average 12 years, 1886-97.....	10	495	447	2,610	452

2.—The prevalence of typhoid fever, or any given disease, as indicated by the “per cent of reports” is taken from the weekly postal-card reports from regular correspondents of the State Board, health officers of cities and villages, and others. The “per cent of reports” is the per cent of the whole number of reports received which stated the presence of the disease named; it gives the relative prevalence of the disease, under the observation of the physicians who report. It may represent the relative area of prevalence of the disease, combined with the relative number of weeks the disease continued where it did occur, *but not the number of cases.*

The weekly card-reports, however, furnish a valuable means of ascertaining, approximately, the relative prevalence of the several diseases in a given year, and the relative prevalence of a given disease in one year compared with other years, and it is as good a scheme for ascertaining the facts as is yet available. Therefore the sickness-statistics based upon those weekly card-reports should be relied upon for a comparison of the relative prevalence of typhoid fever in 1896, compared with preceding years. However, the evidence from the two sources may well be compared.

TABLE 14.—HEIGHT OF GROUND WATER.—*Inches of earth above the water—by, months for the year 1898; also averages for the 12 years, 1886-97, and 14 years 1885-98, at Lansing, Mich.,—well in the Capitol grounds.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1885-98	300	302	302	301	298	297	295	297	298	300	303	304	304
1898	306	311	306	302	297	297	300	300	306	309	313	311	314
Av. 12 years, 1886-97	301	303	303	301	299	297	296	298	299	301	303	305	305

TABLE 16.—TYPHOID FEVER IN MICHIGAN.—*Average per cent of weekly card-reports stating the presence of Typhoid Fever, by months, for 10 years, 1878-87, and in the year 1898; also the average for the 12 years, 1886-97.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878-87...	12	10 ⁸	9	7	5	5	5	7	14	20	22	20	14
1898	8	6	5	6	5	2	3	6	10	14	15	13	7
Av. 12 yrs. 1886-97...	10	7	5	4	3	4	5	7	14	19	20	16	10

TABLE 17.—RAINFALL IN MICHIGAN.—*Average number of inches, by months, for the 10 years, 1878-87, and in the year 1898; also averages for the 12 years, 1886-97.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878-87...	37.27	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
1898	33.19	3.09	2.43	3.27	1.65	2.44	3.87	1.39	3.21	2.85	4.41	2.56	2.02
Av. 12 yrs., 1886-97...	31.47	2.48	2.12	1.95	2.48	3.65	3.03	2.40	2.66	2.85	2.41	3.00	2.44

A comparison of the evidence from the two sources just mentioned, relative to typhoid fever during the years, 1886-1898, is facilitated by Table 13.

TABLE 18.—TEMPERATURE OF THE WATER in the well at the State Capitol in Lansing, Mich., by months for the year 1898; also averages for the 12 years, 1886-97.

Year and period of years.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1898.....	51	51	50	50	50	50	51	52	51	53	53	53	52
Av. 12 yrs., 1886-97.	50	50	48	47	48	49	49	49	51	51	52	52	51

TABLE 19.—Sickness from Typhoid Fever in Michigan (as indicated by the weekly card-reports by all observers) and the depth of earth (in inches) above the water in the well, and the temperature of the water in the well at Lansing, Michigan, averages by year and months for the 12 years, 1886-97.

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from typhoid fever*.....	10	7	5	4	3	4	5	7	14	19	20	16	10
Inches of earth above water in well.†.....	301	303	303	301	299	297	296	298	299	301	303	305	305
Temperature of water in well.‡.....	50	50	48	47	48	49	49	49	51	51	52	52	51

*Per cent of all reports received (from observers in different parts of the State) which stated the presence of typhoid fever, from last line in Table 16.

†This line is copied from the last line in Table 14.

‡This line is copied from the last line in Table 18.

TABLE 20.—Exhibiting the average total annual rainfall at stations in Michigan, the same for Lansing, the inches of earth above the ground water at Lansing, the inches of water in an undisturbed well at Lansing, and the reported sickness, from Typhoid Fever in Michigan, as indicated by the per cent of all the weekly card-reports which stated the presence of typhoid fever, during the year, 1898, and averages for the 12 years, 1886-97.

Year, and period of years.	Average total annual rainfall at stations in Michigan, in inches.	Total annual rainfall at Lansing, in inches.	Inches of earth above the ground water at Lansing.	Inches of water in an unused well at Lansing.	Ground water higher (+) or lower (—) than the 10 years' average, in inches.	Average per cent of all weekly card-reports stating the presence of typhoid fever.	More (+) or less (—) sickness from typhoid fever than the 12 years' average.
1898.....	33.19	31.56	306	19	—4	8	—2
Av. 12 yrs., 1886-97..	31.47	30.23	301	23	.....	10	.....

MEASLES IN MICHIGAN.—DURING THE YEAR ENDING DECEMBER 31, 1898.

There were reported to the Secretary of the State Board of Health, in all, 552 outbreaks of measles, in 480 local jurisdictions, as having occurred in Michigan during the year 1898; and in these outbreaks there were reported to have occurred 11,614 cases and 124 deaths.

The office of the State Board of Health is making constant efforts to get local health officials, and, especially, to induce the people generally to take measures to prevent the spread of measles, and to make reports to the local health officers and to the Secretary of the State Board of Health, concerning that disease in the several localities; but it is probable that a large number of the cases and deaths are not yet reported. From Detroit, for instance, two fatal cases only were reported.

MEASLES IN 1898, COMPARED WITH PREVIOUS YEARS.

According to reports made to the Secretary of the State Board of Health.

TABLE 1.—*Exhibiting the numbers of outbreaks, cases and deaths from Measles, the number of localities in which they occurred, together with the average numbers of cases and deaths per outbreak, and the per cent of cases which proved fatal, for the year 1898, and the averages for the 8 years, 1890-97; with the departure of the same for 1898, from the average of the same for the 8 years, 1890-97.*

Year.	Reported outbreaks.	Reported localities.	Reported cases.	Av. No. of cases per outbreak.	Reported deaths.	Av. No. of deaths per outbreak.	Deaths per 100 cases.
1898.....	552	480	11,614	21.0	124	.22	1.1
Average for 8 years, 1890-97.....	406	365	12,199	30.0	108	.27	.9
Departure of 1898 from the average for 8 years, 1890-97.	+146	+115	-585	-9.0	+16	-.05	+.2

Sickness-rates from reported measles.—The highest sickness-rates from reported measles, by counties, was in Mackinac County, where the rate was 708.91 cases per 10,000 population. The rate in Schoolcraft County was next highest.

The lowest sickness-rate, .21 of one case per 10,000 population, was in Wayne County. This is undoubtedly incorrect, for from Detroit two fatal cases only, were reported. The rate in Genesee County was next lowest—.96 of one case per 10,000 population.

Death-rates from reported measles.—The highest death-rate from reported measles was in Alger County—19.58 cases per 10,000 population, which was about thirty-nine times the average death-rate from measles for the State, and more than double the next highest death-rate (8.0 cases per 10,000 population), which was in Oceana County.

Fatality, or "case-mortality" from measles.—The fatality from reported measles in 1898, i. e., the proportion of reported cases which proved fatal was, for the whole State, 1.1 per cent, or about one death to 100 cases

reported. Exclusive of Wayne County, only the fatal cases having been reported from Detroit, the maximum fatality (14 per cent), occurred in Cheboygan County. The Minimum fatality (.21 of one death per 100 cases) occurred in Mackinac County.

TABLE 2.—Numbers of cases and deaths reported from Measles, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, clerks, etc.)

State and counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	11,614	123	48.61	.51	Keweenaw.....	2,851	0	0	0	0
						Lake.....	5,289	59	0	111.55	0
Alcona.....	5,427	0	0	0	0	Lapeer.....	28,545	38	0	13.31	0
Alger.....	1,532	58	3	378.59	19.58	Leelanau.....	10,967	77	3	70.21	2.74
Allegan.....	39,417	495	3	125.58	.76	Lenawee.....	48,634	104	0	21.38	0
Alpena.....	19,853	4	0	2.01	0	Livingston.....	20,016	10	0	5.00	0
Antrim.....	14,442	213	0	147.49	0	Luce.....	2,241	34	0	151.72	0
Arenac.....	8,203	121	0	147.51	0	Mackinac.....	6,644	471	1	708.91	1.51
Baraga.....	5,428	0	0	0	0	Macomb.....	33,961	102	2	30.03	.59
Barry.....	23,615	83	0	35.15	0	Manistee.....	27,998	299	4	106.79	1.43
Bay.....	66,196	198	2	29.91	.30	Marquette.....	39,936	14	0	3.51	0
Benzie.....	10,889	114	0	104.69	0	Mason.....	20,459	129	0	53.05	0
Berrien.....	49,985	199	4	39.81	.80	Mecosta.....	21,761	139	3	63.88	1.38
Branch.....	25,633	95	1	37.08	.89	Menominee.....	24,947	154	3	61.73	1.20
Calhoun.....	51,443	334	4	64.93	.78	Midland.....	15,779	162	0	102.67	0
Cass.....	21,399	97	2	45.33	.93	Missaukee.....	8,862	41	0	46.26	0
Charlevoix.....	12,322	85	1	68.98	.81	Monroe.....	34,025	49	0	14.40	0
Cheboygan.....	15,814	35	5	22.13	3.16	Montcalm.....	35,679	23	0	6.45	0
Chippewa.....	18,625	339	3	182.01	1.61	Montmorency.....	3,389	0	0	0	0
Clare.....	8,394	0	0	0	0	Muskegon.....	34,635	272	3	78.53	.87
Clinton.....	26,015	6	0	2.31	0	Newaygo.....	17,774	102	2	57.39	1.13
Crawford.....	2,458	0	0	0	0	Oakland.....	44,107	21	0	4.76	0
Delta.....	23,194	600	6	258.69	2.59	Oceana.....	17,500	441	14	252.00	8.00
Dickinson.....	15,448	46	6	29.78	3.88	Ogemaw.....	5,693	18	0	31.62	0
Eaton.....	33,142	126	0	41.04	0	Ontonagon.....	9,990	5	0	5.00	0
Emmet.....	12,638	258	1	204.15	.79	Osceola.....	18,320	11	0	6.00	0
Genesee.....	41,676	4	0	.96	0	Oscoda.....	1,708	0	0	0	0
Gladwin.....	5,592	0	0	0	0	Otsego.....	5,316	134	0	252.06	0
Gogebic.....	15,000	0	0	0	0	Ottawa.....	42,808	8	0	1.87	0
Gd. Traverse.....	21,675	242	2	111.65	.92	Presque Isle.....	7,135	10	0	14.02	0
Gratiot.....	28,884	632	6	218.81	2.08	Rosecommon.....	1,281	1	0	7.81	0
Hillsdale.....	29,844	227	3	75.96	1.00	Saginaw.....	81,421	43	4	5.28	.49
Houghton.....	52,961	8	1	1.51	.19	Sanilac.....	35,301	358	6	101.41	1.70
Huron.....	35,967	115	1	31.97	.28	Schoolcraft.....	8,436	509	3	603.37	3.56
Ingham.....	41,712	16	0	3.84	0	Shiawassee.....	34,756	85	0	24.46	0
Ionia.....	36,839	10	0	2.71	0	St. Clair.....	56,587	329	2	58.19	.35
Iosco.....	9,456	5	0	5.29	0	St. Joseph.....	24,818	42	0	17.00	0
Iron.....	5,561	2	0	3.60	0	Tuscola.....	36,316	37	2	10.19	.55
Isabella.....	24,094	281	2	116.63	.83	Van Buren.....	31,577	536	4	169.74	1.27
Jackson.....	48,039	163	0	33.93	0	Washtenaw.....	44,808	238	0	53.12	0
Kalamazoo.....	44,839	616	4	137.38	.89	Wayne.....	327,808	7	2	.21	.06
Kalkaska.....	6,120	73	0	119.28	0	Wexford.....	16,816	99	1	58.87	.59
Kent.....	133,954	493	5	36.80	.37						

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894.

TABLE 3.—*Exhibiting the numbers of outbreaks and cases of and deaths from Measles which occurred in the cities, villages, and townships of Michigan in 1898, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages, and townships. (Compiled from reports of local health officials to the Secretary of the State Board of Health.)*

Classes of political divisions.	Popula- tion.*	Health jurisdictions.	Outbreaks in:			Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Rates per 10,000 population				
			Localities.		No. of				Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Cases.	Deaths.
			No. of	Per cent of all local- ities.									
State.....	2,389,393	1,582	480	30.3	552	11,614	123	1.1	48.61	.51			
Cities.....	930,834	76	44	57.9	56	3,191	34	1.1	34.28	.37			
Villages.....	256,485	300	94	31.3	106	2,552	17	.7	99.50	.66			
Townships.....	1,202,074	1,206	342	28.3	390	5,871	72	1.2	48.84	.60			

*Estimated by arithmetical method in the office of the State Board of Health.

From the data in the above table it may be observed that 57.9 per cent of the cities, 31.3 per cent of the villages, and 28.3 per cent of the townships were infected with measles. But the average population of the cities is over fourteen times the average population of the villages.† The highest case-rate (99.50) and death-rate (.66) occurred in the villages.

TABLE 4.—*Exhibiting the reported number of outbreaks of Measles which began, the number which ended, and the number which were present, in each month of the year 1898, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began.....	53	43	58	83	68	47	40	14	9	10	11	21	457
Number ended.....	15	31	46	45	76	66	79	29	17	9	6	17	436
Number present...	94	115	143	165	191	151	121	57	32	25	26	40	-----

Number of outbreaks of measles in each month of the year 1898.—The last line of figures in Table 4, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were 21 more beginnings than endings of outbreaks reported during the year 1898.

In computing the number of cases present in each month, each case is counted present in each month in which, or part of which, it was reported to have existed. The number of localities infected in each month were computed in a like manner.

†The average population of the cities is 12,248, of the villages 855, and of the townships 997.

TABLE 5.—*Exhibiting the number and per cent of cases of Measles present, and the number and per cent of cases taken sick, and the number and per cent of localities infected in Michigan in each month during the year 1898.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases present..	726	1,217	1,569	1,738	1,881	1,572	876	194	77	77	185	383
Per cent of cases present..	6	10	14	15	16	14	8	2	1	1	2	3
Number of cases taken sick	652	888	1,204	1,255	1,614	1,114	476	102	44	56	178	286
Percent of cases taken sick	6	8	10	11	14	10	4	1	.4	.5	2	2
Number of localities present.....	93	115	138	161	191	150	121	57	32	25	35	40
Per cent of localities present.....	19	24	29	34	40	31	25	12	7	5	5	8

The fourth line of figures in Table 5 exhibits what per cent the cases taken sick in each month were of the total number (11,614) of cases of measles reported to this office for the year 1898.

The last line of figures in this table exhibits what per cent the localities infected in each month were of the total number (480) of infected localities reported during the year 1898.

Source of contagium of cases of measles.—Of the 11,614 cases of measles reported to this office, as having occurred in Michigan in the year 1898, the local health officials reported relative to the source of contagium in ways which may be summarized as follows: Traced to a former case, 4,376; from outside jurisdiction, 181; probably from an outside jurisdiction, 16; unknown, 6,105; not stated, 933; attributed to infected articles, etc., 3.

Outbreaks of measles reported traced to previous outbreaks.—According to reports of local health officers in Michigan the contagium of measles was permitted to spread from ninety-six outbreaks, having an aggregate of 4,108 cases and fifty-two deaths, to 139 other outbreaks resulting in 2,477 cases and eighteen deaths. From some of these second localities, the contagium was further spread to third localities, resulting in thirty-two outbreaks with 606 cases and four deaths; and from thence to fourth localities resulting in four outbreaks with forty-two cases and one death.

Twenty-seven outbreaks, with an aggregate of 586 cases and five deaths, were reported as having been traced to localities outside of Michigan. From some of these twenty-seven outbreaks, the contagium was further spread to seven localities, resulting in sixty-seven cases and one death, and from thence to three other localities, resulting in twenty-one cases. A total of 212 outbreaks with an aggregate of 3,799 cases and twenty-nine deaths were actually traced to previous outbreaks of measles.

In fourteen outbreaks, with an aggregate of 164 cases and two deaths, the contagium was reported as *probably* traced to other outbreaks in Michigan, and in three outbreaks, with fifteen cases, as *probably* traced to outbreaks outside the State.

Estimated number of outbreaks and cases of measles prevented and lives saved by isolation and disinfection.—Tables 7 and 8 and the accompanying diagram compare the average numbers of cases and deaths in out-

TABLE 7.—MEASLES IN MICHIGAN IN 1898: Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 512 outbreaks reported; (2) in the 219 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 5 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 17 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 11 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 46 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 165 outbreaks in which isolation and disinfection were both neglected; (8) in the 49 outbreaks in which isolation and disinfection were both enforced.

	(1) All outbreaks. (512 outbreaks.)*		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (219 outbreaks.)		(3) Disinfection enforced—Isolation doubtful. (5 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (17 outbreaks.)		(5) Disinfection enforced—Isolation neglected. (11 outbreaks.)		(6) Isolation enforced—disinfection neglected. (46 outbreaks.)		(7) Isolation and disinfection both neglected. (165 outbreaks.)		(8) Isolation and disinfection both enforced. (49 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	9,316	101	2,683	47	34	0	37	1	122	1	174	1	6,150	49	118	2
Averages	18.30	.20	12.25	.21	6.80	0	2.18	.06	11.09	.09	3.78	.02	37.27	.30	2.41	.04

* A definition of the term "outbreak," and the facts relative to methods of compilation of outbreaks, are printed in foot-notes on page 169.

ISOLATION AND DISINFECTION
RESTRICT MEASLES.

Measles in Michigan in the 9 years, 1890-98: Exhibiting the average numbers of cases and deaths per outbreak: in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local Health Officers.)

Scale for cases and Deaths.	Isolation and Disinfection Neglected.		Isolation and Disinfection Enforced.	
	Per Outbreak-Cases.	Deaths.	Per Outbreak-Cases.	Deaths.
50	57.92			
40				
30				
20				
10				
0	.44		2.48	.01

[PLATE 1027]

TABLE 8.—Exhibiting for the 9 years, and for each of the 9 years 1890-98, the numbers of reported outbreaks, cases and deaths from measles; also for this 9-year period, the average number of cases and deaths per outbreak in all outbreaks in those outbreaks in which isolation or disinfection or both were doubtful, isolation and disinfection both neglected; isolation and disinfection both enforced; and, also, the numbers of cases and deaths indicated as having been prevented by isolation and disinfection.

Years.	All outbreaks.				Isolation or disinfection, or both, not mentioned, or statements doubtful.				Isolation and disinfection neglected.				Isolation and disinfection enforced.				Cases and deaths indicated as having been prevented by isolation and disinfection*.	
	Outbreaks.		Deaths.		Outbreaks.		Deaths.		Outbreaks.		Deaths.		Outbreaks.		Deaths.			
	Cases.	Deaths.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.			
1890.....	419	11,189	103	353	6,326	59	57	4,819	44	6	19	0	24,233	220				
1891.....	392	12,338	118	309	6,492	59	71	5,920	63	11	27	0	20,347	231				
1892.....	236	4,406	67	187	2,427	45	31	1,953	22	7	8	0	10,462	101				
1893.....	357	5,440	71	238	2,569	53	70	2,681	14	10	24	0	8,233	0				
1894.....	358	7,345	49	246	4,190	42	70	2,971	7	13	32	0	7,849	0				
1895.....	269	4,462	13	152	2,660	7	56	1,563	6	25	72	0	3,043	14				
1896.....	399	17,068	158	177	4,178	26	146	12,626	131	21	54	0	17,438	201				
1897.....	766	26,458	147	313	7,027	44	324	18,653	101	46	112	0	17,641	90				
1898.....	512	9,318	101	219	2,683	47	165	6,150	49	49	118	2	9,764	53				
Totals for the nine years, 1890-98.....				3,708	98,024	827	2,194	38,552	382	990	57,336	437	188	466	2	119,010 + 116,743	910 805	
Annual averages for the nine years, 1890-98.				412	10,892	92	244	4,284	42	110	6,371	49	21	52	.2	13,223	101	
Average cases and deaths per outbreak { 1890-98.....				26.44	.92	17.57	.17	457.92	4.44	2.48	1.01							

* The numbers of cases and deaths in this double column are found by multiplying "All outbreaks" for each year by the average number of cases or deaths per outbreak in those outbreaks in which isolation and disinfection both were neglected, for that year, and deducting from the results thus obtained, the cases or deaths, as the case may be, which were reported to have occurred that year, to learn the numbers that would have occurred if efforts for the restriction of the disease had not been made. The instances in which isolation and disinfection were enforced are still so few that the evidence is not very satisfactory. † The two sets of numbers appearing in the columns representing cases and deaths saved as explained in the † foot-note; (2) the 116,743 cases and 846 deaths are obtained by multiplying the average numbers of cases and deaths per outbreak for the nine years, 1890-98 (57.92 and .44 where isolation and disinfection were neglected) by the total number of outbreaks to find the numbers which would have occurred if all outbreaks had been neglected, and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the nine-year period. ‡ These figures are graphically represented in the diagram on the preceding page.

breaks of measles where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where these measures were neglected.* By Table 8 it may be seen that during the nine years, 1890-98, there were about twenty-three times as many cases per outbreak in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 7 it may be seen that during the year 1898 there were reported to the office of the State Board of Health 512 outbreaks of measles, with 9,318 cases and 101 deaths.† Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed, "Isolation and disinfection both neglected," there would have occurred 19,082 cases and 1.54 deaths, and taking from these respectively the cases (9,318) and deaths (101) which did occur, leaves 9,764 cases and 53 deaths indicated as prevented in these 512 outbreaks, by isolation and disinfection. By the same method for each year the indicated saving in the 3,708 outbreaks which occurred during the nine years, 1887-98, is 116,743 cases and 805 lives. This is shown in Table 8.

Period of incubation in measles.—The average of the 102 reported periods of incubation is about 10.5 days. The greatest number of cases in any one period was in the ten-day period. Further details are in Table 9.

TABLE 9.—*Exhibiting the reported period of incubation, stated in days, in 102 instances of Measles. Compiled from reports of health officers in Michigan for the year 1898.*

Incubation period—days..	3	5	6	7	8	9	10	11	12	13	14	15	16	18	20	21	22
Cases in each period.....	1	3	3	*18	†9	‡12	§20	¶4	||8	1	**12	2	1	1	1	5	1

*In 6 instances, reported as about 7 days. †In 2 instances, reported as about 8 days. ‡In 1 instance, reported as about 9 days. §In 4 instances, reported as about 10 days. ¶In 1 instance, reported as about 11 days. ||In 6 instances, reported as about 12 days. **In 4 instances, reported as about 14 days.

*In the compilation of the reports for Tables 7 and 8 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and disinfection enforced." If, however, he neglects to properly isolate and disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed, "Isolation or disinfection or both not mentioned, or statements doubtful."

†*Definition of outbreak.*—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended, unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of years require that outbreaks be counted as closed, at the end of the year; while in comparing outbreaks for testing the value of isolation and disinfection it is necessary to take complete outbreaks, even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

Ages of greatest prevalence of, and mortality from measles.—The reports of local health officials in Michigan, for the year 1898, stated the ages of 3,857 persons who were sick with measles, and the ages of 114 persons who died of that disease.

There are two erroneous and very harmful beliefs, quite prevalent among parents,—that measles cannot ultimately be escaped any more than teething, and that the least dangerous time for persons to have the disease is while quite young children. Whatever ground there may be for these beliefs elsewhere, reports to this office, as may be seen in tabulated form in Tables 7 and 8, and Tables 10, 11, 12, 13 and 14, of this article, show that none exists in Michigan; but that, on the contrary, facts here bear evidence that measles is a preventable disease; and that it is *more* fatal to young children than to persons in middle age.

Table 10 shows that for the year 1898, 61.4 per cent of all deaths from this disease was in children under five years of age. Table 11 shows that for a period of seven years, 1892-98, 56.3 per cent of all deaths from measles was in children under five years old.

Table 10 shows that in 1898, 30.9 per cent of all children under one year old, who were sick with measles, died; and that the fatality in the earlier

TABLE 10.—*Exhibiting in certain age-groups, the number of cases and the number of deaths from Measles; the per cent that the cases in each group were of all cases of known ages, the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group. Compiled from all reports for the year 1898 which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																			
Ages in groups of years.	All ages known.	Under 1.	1.	2.	3.	4.	Under 5.	5-9.	10-14.	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50-54.	55-59.	60 and over.	
No. of cases*-----	3,857	94	147	175	193	218	827	1,388	697	403	213	109	84	67	38	15	6	4	6	
Per cent the cases in each group were of all cases of known ages-----	100	2.4	3.8	4.5	5.0	5.7	21.4	36.0	18.1	10.4	5.5	2.8	2.2	1.7	1.0	.4	.2	.1	.2	
No. of deaths*-----	114	29	22	8	9	2	70	13	8	8	7	3	1	2	2	0	0	0	0	
Per cent the deaths in each group were of cases in that group-----	3.0	30.9	15.0	4.6	4.7	.9	8.5	.9	1.1	2.0	3.3	2.8	1.2	3.0	5.3	0	0	0	0	
Per cent the deaths in each group were of all deaths, at known ages-----	100	25.4	19.3	7.0	7.9	1.8	61.4	11.4	7.0	7.0	6.1	2.6	.9	1.8	1.8	0	0	0	0	
Per cent the deaths in special groups were of all deaths, known ages-----		61.4					----	25.4			13.2			0						

* Does not include those cases or deaths where the age was not stated.

ages was much greater than in middle life. Table 14 shows that for the period of nine years, 1890-98, the fatality was great among children under one year, and high in old age from sixty years and upwards.

TABLE 11.—*Exhibiting in certain age-groups, the number of cases and the number of deaths from Measles in the year 1898, and the averages for the 9 years, 1892-98; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths. (Compiled from all reports for the years 1892-98 which stated the ages.)*

Year.		Total No. included.	Per cent of cases and deaths in certain age-groups.													
			All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 Years and over.
1898.	Cases.....	3,857	100	21.4	36.0	18.1	10.4	5.5	2.8	2.2	1.7	1.0	.4	.2	.1	.2
	Deaths.....	114	100	61.4	11.4	7.0	7.0	6.1	2.6	.9	1.8	1.8	0	0	0	0
1892-98.	Cases.....	28,885	100	24.0	41.9	16.0	7.8	4.3	2.2	1.6	1.1	.6	.2	.1	.1	.1
	Deaths.....	279	100	56.3	13.3	9.7	6.1	4.3	3.9	1.4	1.4	1.8	.4	.7	0	.7

TABLE 12.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from Measles, in Michigan, during the year 1898, and the averages for the 6 years 1893-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of persons who re- covered, years.	No. of cases in- cluded.	Age.—In periods of years. Per cent of (non-fatal) cases in each period.													
				All ages.	Under five years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 years and over.
1898.	Males.	10.9	1,922	100	20.5	37.8	17.5	10.5	6.2	2.8	1.7	1.7	.8	.3	.1	.1	.2
	Females..	11.3	1,821	100	19.9	35.6	19.4	10.6	4.7	2.9	2.8	1.8	1.2	.5	.2	.2	.2
1893-98.	Males.	9.4	13,967	100	23.7	43.5	15.5	7.4	4.6	2.2	1.4	1.0	.5	.2	.1	.04	.1
	Females..	9.7	13,887	100	23.9	41.4	16.4	8.0	4.0	2.2	1.8	1.1	.7	.3	.1	.1	.1

TABLE 13.—*Exhibiting, by sex, the per cent of persons in certain age-groups who died of Measles during the year 1898, and the averages for the six years, 1893-98.*

Year.	Sex.	Average age of decedents, years.	No. of cases included.	Per cent of deaths in certain age-groups.											
				All ages.	Un-der 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 years and over.	
1896.	Males.....	7.7	45	100	60.0	13.3	4.4	6.7	6.7	2.2	0	4.4	2.2	0	
	Females	6.9	69	100	62.3	10.1	8.7	7.2	5.8	2.9	1.4	0	1.4	.0	
1893-98.	Males.....	7.9	101	100	58.4	11.9	7.9	7.9	5.9	3.0	0	2.0	3.0	0	
	Females	9.0	144	100	59.7	8.3	9.0	6.3	4.2	4.2	2.8	1.4	1.4	2.8	

Case-mortality rates from measles at the different ages.—The total number of cases in which the ages were given, for the period of nine years, 1890-98, was 34,195 cases, of which number 328 were fatal cases,—giving a fatality, or a case-mortality rate, for this period of years, of persons at all ages, of .96 of one death per 100 cases of measles.

TABLE 14.—*In certain age-groups, the numbers of cases and deaths from Measles in the 9 years, 1890-98, and the per cent that the deaths in each group were of the cases in that group. (Compiled from all the reports to the Secretary of the State Board of Health for the years, 1890-96, which stated the ages.)*

	Un- der 1 year.	Un- der 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 to 64.	65 and over.
Cases—1890-98.....	493	8,153	14,020	5,608	2,803	1,547	760	558	372	202	94	30	17	17	14
Deaths—1890-98.....	56	180	46	29	23	15	11	6	5	6	2	2	0	2	1
Per cent.....	11.4	2.2	.3	.5	.8	1.0	1.4	1.1	1.3	3.0	2.1	6.7	0	11.8	7.1

Average duration of measles.—Fatal and non-fatal cases.—The average duration of sickness from measles in non-fatal cases in 1898, was 12.1 days for males and 12.4 days for females. The average duration of fatal cases in 1898 was 10.7 for males and 11.5 for females.

TABLE 15.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from Measles, in Michigan, during the year 1898, and the averages for the 7 years, 1892-98. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of measles.											
Year.	Sex.	No. of cases in- cluded.	Duration of sickness:—Per cent of deaths in each period of days.								
			All cases.	1 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	
1898.	Males.....	27	100	25.9	48.1	14.8	3.7	0	3.7	0	3.7
	Females.....	38	100	36.8	42.1	10.5	0	2.6	2.6	0	5.3
1892-98.	Males.....	76	100	35.5	38.2	10.5	9.2	1.3	4.0	0	1.3
	Females.....	101	100	27.7	33.7	21.8	5.9	5.0	2.0	1.0	3.0

Proportion of measles in the different months of the year 1898.—Table 17 exhibits evidence, from two sources, on the proportion of measles reported in each month of the year 1898, namely, the sickness statistics and the contagious-disease statistics. The *first* line states the per cent of all weekly postal-card reports, made by physicians in active general practice, which reported the presence of measles under their observation. The *second* line states the average per cent of all these reporters who stated the presence of measles. The *third* line states the average order of prevalence of measles in the list of diseases reported. The *fourth* line represents the *prevalence* of measles, according to the sickness statistics, being

TABLE 16.—*Exhibiting, by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from Measles in Michigan, during the year, 1898, and the averages for the 7 years, 1892-98. Per cent of cases arranged in five-days groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of measles.															
Year.	Sex.	No. of cases in- cluded.	Duration of sickness:—Per cent of cases in each period of days.												
			All peri- ods.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1898.	Males.....	1,436	100	8.4	39.8	32.0	11.1	4.9	2.2	.5	.4	.1	.2	.1	.2
	Females.....	1,400	100	6.6	41.3	31.6	10.4	6.5	1.7	1.1	.3	.4	.2	0	.1
1892-98.	Males.....	8,793	100	6.6	40.2	39.9	7.7	2.7	1.2	.5	.5	.2	.1	.1	.1
	Females.....	8,712	100	6.9	39.4	40.9	7.5	2.9	1.1	.6	.4	.2	.2	.01	.1

a combination of the first and third lines of this table (the method of combining them is explained on pages 122-3 of the annual report of this Board for the year 1890). In this fourth line the smallest numbers indicate the greatest prevalence,—for instance, May is 1 or *first* in prevalence,—more measles in May than in any other month; June is 2 or *second* in prevalence; April is 3 or *third* in prevalence; and so on. The *fifth* line represents by months the number of outbreaks of measles reported to this office by health officers and clerks, including only the reports which

TABLE 17.—*Measles in Michigan during the year 1898, exhibiting, by months, the per cent of all weekly card-reports received which stated the presence of Measles; the average per cent of all observers reporting weekly who reported Measles; the average order of prevalence of Measles where it was present; the prevalence of Measles, according to the sickness statistics, and the number of outbreaks of Measles reported by health officers and clerks of local boards of health.*

1898.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Per cent of weekly card reports stating presence of measles.....	7	10	6	11	17	10	14	8	4	2	0.5	0	2
Average per cent of observers who reported measles present.....	12	17	11	18	27	18	24	15	10	4	2	0	4
Average order of prevalence where present.....	2.7	2.7	1.8	2.0	2.3	1.5	2.0	2.6	1.9	2.6	2.0	0	3.0
Prevalence*.....	10	7	5	4	3	1	2	8	6	10	9	0	11
Outbreaks†.....	457	53	43	58	83	68	47	40	14	9	10	11	21

*According to the sickness statistics, as explained in the text accompanying this table. In the fourth line of figures in this table, the smallest numbers indicate the greatest prevalence.

†The numbers in this line show the numbers of outbreaks which began each month.

gave the dates of outbreaks,—reports of fifty outbreaks did not give dates and, of course, those outbreaks could not be included in this line.

The evidence of the sickness-statistics, summarized in the fourth line of this table (17) indicates that the maximum prevalence of measles in Michigan in 1898 occurred in May, and the minimum where sickness was reported present was in December. The fifth line of the table, which is based on the contagious-disease statistics, indicates that the maximum number of reported outbreaks occurred in May and the minimum in September. This evidence is only for a single year, and might, therefore, be exceptional. In Exhibit X., of this annual report for 1898, is a statement of the average per cent of weekly card reports stating the presence of measles by months for the twenty-one years, 1877-97, from which it appears that the maximum occurs in May, and the minimum alike in September and October.

WHOOPIING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health, 294 outbreaks of whooping-cough in 282 localities in Michigan, which resulted in 5,300 cases and 267 deaths, with an average of 18.8 cases and .95 of one death per locality. The death-rate from this disease for the State in 1898, according to reports to this office, was 1.12 deaths per 10,000 inhabitants.

TABLE 1.—*Whooping-Cough in Michigan in 1898, and the total and average for the 12 years, 1887-98. Exhibiting the numbers of reported cases and deaths and the number of localities in which the presence of the disease was reported, together with the cases and deaths per locality and per 100,000 inhabitants, and the per cent the deaths were of cases. (Compiled from reports received at the office of the Secretary of the State Board of Health.)*

Years.	Cases.	Deaths.	Localities.	Cases per locality.	Deaths per locality.	Cases per 100,000 inhabitants.	Deaths per 100,000 inhabitants.	Per cent deaths were of cases.
1898	5,500	* 267	282	18.8	.95	222	11.2	5
Totals, 1887-98.	41,620	1,143	2,404	-----	-----	-----	-----	-----
Av. for 12 years...	3,469	95	200	17.3	.48	156	4.3	• 2.7

*In numerous instances only the fatal cases were reported to this office.

Whooping-cough in 1898, compared with previous years.—Whooping-cough is being somewhat more frequently and carefully reported to the health authorities each year. The State Board of Health has been persistent in its efforts to educate the people to an understanding of its danger; but the old fallacy that all children must have the whooping-cough, clings with pernicious tenacity, and a considerable proportion of the reports to the office of the Secretary of the State Board of Health tell how mothers persist in exposing their children to whooping-cough.

The Vital Statistics of Michigan show a total number of 4,043 deaths from measles and 4,102 deaths from whooping-cough during the twenty-eight years, 1869-96. On account of the change in the registration laws of the State, the reports to the Secretary of State of deaths in 1897 have not at this date been completely compiled; but in 1898 there were reported to the Secretary of State 131 deaths from measles and 282 deaths from whooping-cough. So for the twenty-nine years, 1869-96 and 1898, there were reported to the Secretary of State 4,174 deaths from measles and 4,384 deaths from whooping-cough. From the point of view of deaths these two diseases are of about equal importance and although measles is generally looked upon as the more to be avoided, slightly more deaths were caused by whooping-cough.

While the death-rates from measles, scarlet fever, diphtheria, etc., have decreased very considerably, the annual death-rate from whooping-cough

TABLE 2.—*Numbers of cases and deaths reported from Whooping-Cough per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, clerks, etc.)*

State and counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	5,300	267	22.18	1.12	Keweenaw... Lake.....	2,851 5,289	16 4	0 0	56.12 7.56	0 0
Alcona.....	5,427	0	0	0	0	Lapeer.....	28,545	60	3	21.02	1.05
Alger.....	1,532	25	2	163.19	13.05	Leelanau....	10,967	0	0	0	0
Allegan.....	39,417	1	1	.25	.25	Lenawee....	48,634	9	2	1.85	.41
Alpena.....	19,853	69	5	34.81	2.52	Livingston..	20,016	32	1	15.99	.50
Antrim.....	14,442	4	0	2.77	0	Luce.....	2,241	0	0	0	0
Arenac.....	8,203	30	3	36.57	3.66	Mackinac....	6,644	1	0	1.51	0
Baraga.....	5,428	0	0	0	0	Macomb.....	33,961	157	8	46.23	2.36
Barry.....	23,615	0	0	0	0	Manistee....	27,998	102	6	36.43	2.14
Bay.....	66,196	441	34	66.62	5.14	Marquette... Mason.....	39,936 20,459	44 0	3 0	11.02 0	.75 0
Benzie.....	10,889	26	0	23.88	0	Mecosta.....	21,761	152	4	69.85	1.84
Berrien.....	49,985	222	11	44.41	2.20	Menominee..	24,947	155	4	62.13	1.60
Branch.....	25,623	69	3	26.93	1.17	Midland....	15,779	15	2	9.51	1.27
Calhoun.....	51,443	64	9	12.44	1.75	Missaukee... Monroe.....	8,862 34,025	0 297	0 5	0 87.29	0 1.47
Cass.....	21,399	12	2	5.61	.93	Montcalm....	35,679	42	2	11.77	.56
Charlevoix..	12,322	4	1	3.25	.81	Montmorency	3,389	1	1	2.95	2.95
Cheboygan..	15,814	104	8	65.76	5.06	Muskegon....	34,635	5	1	1.44	.29
Chippewa....	18,625	1	0	.54	.54	Newaygo....	17,774	22	1	12.38	.56
Clare.....	8,394	0	1	0	0	Oakland.....	44,107	42	0	9.52	0
Clintoff....	26,015	14	1	5.38	.38	Oceana.....	17,500	0	0	0	0
Crawford....	2,458	33	1	134.26	4.07	Ogemaw.....	5,693	0	0	0	0
Delta.....	23,194	469	15	202.21	6.42	Ontonagon..	9,990	0	0	0	0
Dickinson...	15,448	37	1	23.96	.65	Osceola.....	18,320	2	0	1.09	0
Eaton.....	33,142	14	0	4.22	0	Oscoda.....	1,708	0	0	0	0
Emmet.....	12,638	0	0	0	0	Otsego.....	5,316	0	0	0	0
Genesee.....	41,676	18	3	4.32	.72	Ottawa.....	42,808	34	2	7.94	.47
Gladwin.....	5,592	80	1	143.06	1.79	Presque Isle.	7,135	0	0	0	0
Gogebic.....	15,000	202	0	134.67	0	Rosecommon.	1,281	0	0	0	0
G'd Traverse	21,675	66	1	30.45	.46	Saginaw....	81,421	50	14	6.14	1.72
Gratiot.....	28,884	5	0	1.73	0	Sanilac.....	35,301	218	3	61.75	.85
Hillsdale...	29,884	124	0	41.49	0	Schoolcraft.	8,436	1	1	1.11	1.11
Houghton....	52,961	513	13	96.86	2.45	Shiawassee..	34,756	32	2	9.21	.58
Huron.....	35,967	103	1	28.63	.28	St. Clair....	56,537	61	7	10.79	1.24
Ingham.....	41,712	11	1	2.64	.24	St. Joseph... Tuscola....	24,818 36,316	38 74	0 4	15.31 20.38	0 1.10
Ionia.....	36,839	2	0	.54	0	Van Buren..	31,577	129	3	40.85	.95
Iosco.....	9,456	11	1	11.63	1.06	Washtenaw..	44,808	19	1	4.24	.22
Iron.....	5,561	0	0	0	0	Wayne.....	327,808	149	49	4.55	1.49
Isabella.....	24,094	3	0	1.25	0	Wexford.....	16,816	3	1	1.78	.59
Jackson.....	48,039	328	12	68.28	2.50						
Kalamazoo...	44,839	114	5	25.42	1.12						
Kalkaska....	6,120	2	0	3.27	0						
Kent.....	133,954	113	1	8.44	.07						

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894.

in Michigan has not shown such a favorable decrease. When the same amount of care is taken in the isolation of cases of whooping-cough, and disinfection of premises infected with that disease, as is observed in the

other diseases mentioned above, there will probably be a marked decrease in the death-rate from whooping-cough.

Table 1 and the reports from which it was made show that the numbers of cases and deaths from whooping-cough reported to the Secretary of the State Board of Health, during the twelve years, 1887-98, have slowly increased from year to year, the per cent of deaths to cases have remained about the same, although increased slightly in 1898; the death-rate has varied slightly, but without any uniformity, the number of reported cases to 100,000 population has increased directly with the increased number of cases reported. Although the proportion of all cases which occur that are reported is evidently increasing, it is probable that there are still cases and deaths from whooping-cough in Michigan, which are not yet reported to this office. During the year 1898 there were 282 deaths from whooping-cough reported to the Secretary of State, and fifteen less, or 267 deaths from the same disease reported to this office.

Distribution of whooping-cough by counties in Michigan during 1898.—Table 2 exhibits the distribution of whooping-cough by counties in this State during the year 1898, according to the reports made to the Secretary of the State Board of Health. The table shows the reported numbers of cases and deaths, also the sickness and death-rates from whooping-cough in each county from which the disease was reported.

Sickness and death-rates from whooping-cough.—By this table (2) it appears that the lowest sickness-rate (.25 of one case per 10,000 population) was reported from Allegan County. Each of the two counties, Ionia, with a population of 36,839, having two cases; and Chippewa, with a population of 18,625 having one case, had the next lowest sickness-rate (.54 of one case per 10,000 population). It is not probable that all the cases of whooping-cough in these counties have been reported, for experience has taught that all the cases of the disease are not generally reported.

The highest sickness-rate (202.21 cases per 10,000 population) was reported from Delta County, which has a population of 23,194, and had 469 cases in 1898.

The lowest death-rate shown by Table 2, from counties from which deaths were reported was .07 of one death per 10,000 population, from Kent County, with a population of 133,954 and only one death from whooping-cough.

Whooping-cough in each month of the year, 1898.—From Table 3 it appears that the prevalence of whooping-cough is quite uniform throughout the year. A study of Exhibit X., of the article on "Sickness Statistics" in this report, shows that whooping-cough, according to the weekly card-reports made to this office, during the twenty-one years, 1877-97, varied but little in the different months; the *lowest* monthly average of reports which stated the presence of whooping-cough was 13 per cent of all reports received, while the *highest* monthly average was only 17 per cent. The general monthly average for the twenty-one years was 15 per cent.

Source of contagium of whooping-cough and how the disease is spread.—Of the 5,300 cases of whooping-cough reported, during the year 1898, as exhibited in the following table, the local health officers reported the source of contagium as follows: Traced to a former case, 1,097; from outside jurisdiction, 56; probably from outside jurisdiction, 12; contracted in school, 22; unknown, 3,032; not stated or indefinitely reported, 1,013.

TABLE 3.—*Exhibiting the reported number of outbreaks of Whooping-Cough which were present, in each month of the year 1898, in the different local jurisdictions of Michigan.*

Months.....	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Outbreaks present.....	27	37	44	65	74	77	86	82	85	68	47	50

From the reports by registrars to the Secretary of State in which no source of contagium was mentioned, 68; total 5,300.

TABLE 4.—*Reported source of contagium of cases of whooping-cough, in 1898.*

Traced to a former case.....	1,097
Contagium reported as from outside jurisdiction.....	56
Contagium reported as probably from outside jurisdiction.....	12
Contracted in school.....	22
Unknown or reports not definite (includes those reported "Contagium," "Sporadic," "Spontaneous," "De Novo," etc.).....	3,032
Not stated, including cases reported by registrars to Secretary of State.....	1,081
All cases.....	5,300

Cases traced to a preceding case.—Table 4, shows that of the 5,300 reported cases of whooping-cough in the State in 1898, 1,097 were reported as traced to preceding cases of the disease.

Contagium from outside jurisdictions.—This was frequently reported in 1898, and indeed in each of the years 1896, 1897 and 1898. Mothers, with their whooping-cough-infected children, are often reported as visiting the community, sometimes with no objection from either the persons visited or the health authorities, bringing the infection with them and sowing the seeds of the disease to ripen into an outbreak among the children of the visited locality.

Whooping-cough in the schools.—The schools, especially the district and village schools, are not exempt from the careless infection from whooping-cough; at home, scarcely considered as dangerous, but little attempt is made to keep the infection from the schools until in some instances, the disease becomes sufficiently prevalent in the community as to cause investigation, and then, perhaps, partial isolation, after it is too late to prevent an epidemic.

While some of the localities in the State, and a portion of the people, are in sympathy with the modern sanitary thought and the restriction of this disease, and while the statements above do not apply to every locality and all the population of the State, still experience, based on the reports from the various parts of the State bears out the statements. Table 5 shows that of 272 outbreaks, in 151 of them isolation and disinfection were either not mentioned or the statements were so doubtful as to be impossible of classification; a majority of them were probably neglected; in two outbreaks disinfection was enforced and isolation was doubtful; in eight outbreaks, isolation was enforced, but disinfection was doubtful; in three outbreaks disinfection was enforced and isolation was neglected; in two outbreaks isolation was enforced and disinfection was

neglected; in ninety-nine outbreaks isolation and disinfection were both neglected, and out of the 272 outbreaks reported, only seven were reported as enforced. The results of the different modes of action are shown in Table 5, and are commented on in the text.

Transgression of the public health laws.—Strict isolation and disinfection enforced in the 272 outbreaks of whooping-cough would have lessened to a considerable degree the number of cases and deaths from the disease in 1898, and the carelessness on the part of physicians in some cases, health officers in some, and the people generally, borders on criminality. Such carelessness must be due to ignorance of the importance of the disease, for whooping-cough, for the past five years, has caused more deaths in Michigan than either scarlet fever or measles, and when this information has become sufficiently familiar to the people of the State, and the vital necessity of the isolation and disinfection of the disease is fully understood, then coöperation may be expected, and a diminution of the number of cases and deaths from whooping-cough may be expected.

Estimated number of outbreaks and cases of whooping-cough prevented and lives saved by isolation and disinfection.—Comparisons are made in Table 5, of the average numbers of cases and deaths in outbreaks of whooping-cough where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in outbreaks where these measures were neglected.*

By this table (5) it may be seen that during the year 1898 there were reported to the office of the State Board of Health, 272† outbreaks of whooping-cough, with 5,755 cases and 205 deaths. Had no efforts at restriction been made, and had the average number of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 11,424 cases and 269 deaths. Had the average numbers of cases in all outbreaks been the same as those in the column headed "Isolation and disinfection both enforced," there would have occurred only 734 cases, or 5,021 cases of sickness from whooping-cough would have been prevented; and if all the outbreaks had been neglected, there would have been an increase of sixty-

*In the compilation of the reports for Table 5 showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and disinfection enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned; or statements doubtful."

†Whenever a break of sixty days or more has occurred in the progress of a communicable disease in a given township, village or city it has hitherto been regarded as two different outbreaks, but in estimating outbreaks for this Table 5 and the corresponding tables for other diseases, if the second appearance of the disease originated from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of years require that outbreaks be counted as closed at the end of the year; while in comparing outbreaks for testing the value of isolation and disinfection it is necessary to take complete outbreaks, even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

TABLE 5.—WHOPING-COUGH IN MICHIGAN IN 1898: Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 272 outbreaks reported; (2) in the 151 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 2 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 8 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 3 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 2 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 99 outbreaks in which isolation and disinfection were both neglected; (8) in the 7 outbreaks in which isolation and disinfection were both enforced.

	(1) All outbreaks. (272 outbreaks.)		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (151 outbreaks.)		(3) Disinfection enforced—Isolation doubtful. (2 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (8 outbreaks.)		(5) Disinfection enforced—Isolation neglected. (3 outbreaks.)		(6) Isolation enforced—disinfection neglected. (2 outbreaks.)		(7) Isolation and disinfection both neglected. (99 outbreaks.)		(8) Isolation and disinfection both enforced. (7 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	5,755	205	1,407	102	13	1	28	2	57	2	10	0	4,161	98	19	0
Averages	20.79	.75	9.7	.67	6.5	.50	3.5	.25	19	.68	5	0	42.0	.99	2.7	0

four deaths over the number reported, but as no deaths were reported in those outbreaks where isolation and disinfection were enforced, it is impossible to closely approximate the life saving through those precautionary measures.

Period of incubation, in whooping-cough.—The average period of incubation in the twenty-eight reported instances is twelve days; the greatest number of instances given in any single period was in the ten-day period.

TABLE 6.—*Exhibiting the reported period of incubation, stated in days, in 28 instances of Whooping-Cough. Computed from reports of health officers in Michigan, for the year 1898.*

Incubation period—days.....	3	7	9	10	11	12	14	15	21	28
Instances in each period.....	1	*3	4	+8	+2	1	\$4	1	†3	||

*In 3 of these instances, reported as about 7 days.—†In 8 of these instances, reported as about 10 days.—‡In 1 of these instances, reported as about 11 days.—§In 1 of these instances, reported as about 14 days.—||In 3 of these instances, reported as about 21 days.—||In 1 of these instances, reported as about 28 days.

*Ages of greatest prevalence of mortality from whooping-cough.**—In Table 9 are shown the numbers of cases and deaths from whooping-cough in Michigan in 1898, in which the ages were stated in the health officers' reports. In this table the cases and deaths are arranged in *age-groups*, showing what per cent the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; the per cent the deaths in each group were of the cases in that group, and the per cent the deaths in special groups were of all deaths.

The data shown in Tables 8 and 9, although limited to those fatal and non-fatal cases of whooping-cough where the sex and ages were stated in the reports for the year 1898, yet the information agrees quite nearly with statistics collected in this and other countries. Females are generally supposed to be more liable to this disease than males. Of the 712 non-fatal cases, where sex and ages were stated, 50.4 per cent were females and 49.6 per cent males. Of the 254 deaths (Table 9) 55.5 per cent were females and 44.5 per cent were males. There were not only a greater number of cases and deaths from whooping-cough among females, but the sickness-rates and death-rates were greater for females than for males, since for the year 1898 the estimated number of females living in Michigan was less than the estimated number of males in each corresponding age-period.

Average duration of whooping cough.—*Fatal and non fatal cases.*—From Table 10, it may be seen that of the sixty-two males and ninety-one females who were reported to have died from whooping-cough in 1898, and in which instances the interval between the day of being taken sick and the day of death was given, the largest per cent of males died between the eleventh and fifteenth, and the twenty-first to the twenty-fifth days of sickness, 21 per cent of the whole number of deaths occurring in each of

*In compiling data relative to ages, used in tables in this article each age-period begins and ends on the birthday. For arranging the ages by single years or in age-periods the following method is pursued:—From birth to one year old is the *first* year. Those one year old and less than two years old are classed in the second year. The third year of age includes all persons over two years and less than three years of age, and so on for each succeeding year. In dividing the ages into five-year periods, the first period includes all ages from birth to five years, or all under five years of age. The second five-year period includes all ages of five years and over and less than ten years. In each succeeding period the same arrangement is followed.

TABLE 7.—*Exhibiting in certain age-groups, the numbers of cases and deaths from Whooping-Cough, the per cent that the cases in each group were of all cases of known ages; the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group. Compiled from all reports for the year 1898, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.*																
Ages in groups of years.	All known ages.	0-1.	1-2.	2-3.	3-4.	4-5.	Under 5.	5-9.	10-14.	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50 and over.
No. of cases.....	+966	196	129	81	94	88	588	284	66	12	5	6	1	2	1	0	1
Per cent the cases in each group were of all cases of known ages..	100	20.3	13.4	8.4	9.7	9.1	60.9	29.4	6.8	1.2	.5	.6	.1	.2	.1	-----	.1
No. of deaths.....	+254	152	57	16	15	2	242	11	0	0	1	0	0	0	0	0	0
Per cent the deaths in each group were of all cases in that group...	26.2	77.6	44.2	19.8	16.0	2.3	41.2	3.9	0	0	20.0	0	0	0	0	0	0
Per cent the deaths in each group were of all deaths, known ages..	100	59.8	22.4	6.3	5.9	.8	95.3	4.3	-----	-----	.4	-----	-----	-----	-----	-----	-----
Per cent the deaths in special groups were of all deaths, known ages	-----	95.3					99.6			.4							

†Does not include those cases or deaths where the age was not stated.

TABLE 8.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from Whooping-Cough, in Michigan, during the year 1898; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of persons who re- covered, years.	No. of cases in- cluded.	Age.—In periods of years. Per cent of (non-fatal) cases in each period.*											
				All ages	Un- der 5 years	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 and over.
1898.	Males.....	5	353	100	50	38	8	1	1	1	+	+	+	+	
	Females.....	6	359	100	47	39	11	2	1	1	---	+	---	---	

*On a preceding page, a foot-note to the sub-head under which this table appears, explains these age-groups.

†One case reported.

these periods; and the largest per cent of females died between the twenty-first and twenty-fifth days of sickness.

The average duration of the fatal cases, in 1898, was twenty-one days for males and twenty days for females.

The instances where the duration of sickness of fatal cases of whooping-cough, which were reported in 1896 and 1897, were too few to give really reliable information, but a continuation of this table for several years will show interesting facts as to the length of time fatal cases of whooping-cough are likely to last, and the time when grave symptoms may be expected and met by proper treatment.

TABLE 9.—*Exhibiting, by sex, the per cent of persons in certain age-groups who died of Whooping-Cough during the year 1898.*

Year.	Sex.	Average age of decedents.	No. of cases included.	Per cent of deaths in certain age-groups.*					
				All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.
1898.	Males.....	9 months.	113	100	97	3	0	0	0
	Females.....	1 year, 8 mo.	141	100	94	6	0	0	+

*On a preceding page, a foot-note to the sub-head under which this table appears, explains these age-groups.

†One female twenty-two years of age died in 1898.

TABLE 10.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from Whooping-Cough in Michigan, during the year 1898. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of whooping-cough.											
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.								
			All cases.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 and over.
1898.	Males.....	62	100	10	16	21	6	21	8	6	11
	Females.....	91	100	12	16	18	9	19	12	5	9

The above remarks concerning the limited amount of material in this table of fatal cases holds true also for Table 11.

TABLE 11.—*Exhibiting by sex of patient, the duration (in days) of non-fatal cases of sickness from Whooping-Cough, in Michigan, during the year 1898. Per cent of cases arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of whooping-cough.																	
Year.	Sex.	No. of cases in-cluded.	Duration of sickness:—Per cent of cases in each period of days.														
			All periods.	1 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	61 to 65.	66 to 70.	71 to 75.	75 and over.
1898.	Males.....	167	100	3	5	7	5	11	15	25	8	9	2	1	2	2	3
	Females.....	170	100	4	5	5	12	5	9	21	11	11	5	2	1	2	7

Table 11 shows that in non-fatal cases of whooping-cough for the year 1898, the duration of sickness in five-day periods showed an increased per cent in the period from forty-one to forty-six days, and a small per cent in both sexes lasted over seventy-five days.

The average duration of the non-fatal cases, in 1898, was forty-seven days for males and forty-three days for females.

The long reported duration is probably from the confusion of the characteristic cough with the duration of the disease.

The length of time wherein the duration of fatal and non-fatal cases of whooping-cough has been observed is not yet sufficient to permit the giving of certain information as to when the gravest symptoms of the disease may be anticipated, that is, at what period of days most of the deaths have occurred. But from the present information it is safe to admonish those having the care of children so afflicted to watch the case carefully until after the thirty-fifth day of sickness, for from the first to the fifth day, especially in younger children, 86 per cent of whom died within that period in 1896, and 96 per cent in 1898, up to the fifteenth and frequently to the thirty-fifth day, a considerable per cent of deaths are reported to have occurred.

The lesson of the experience may well be summed up in the constant warning advanced and persisted in by the State Board of Health,—“Prevent the disease by isolation of the first cases, disinfect the sick room and all that comes in contact with the patient,” and the number of cases will be lessened, the deaths from whooping-cough will be diminished.

SMALLPOX (VARIOLA) IN MICHIGAN, IN 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health seven outbreaks of smallpox in five localities in Michigan which resulted in thirty-two cases with one death. For the same year (1898) there were reported to the Secretary of State the same number of deaths from smallpox, as were reported to this office.

Distribution of smallpox by counties during 1898.—The distribution by counties is shown in Table 1, as follows:

TABLE 1.—*Numbers of reported cases and deaths from Smallpox and the numbers per 10,000 persons living in each county in Michigan (from which Smallpox was reported) during the year 1898. (Compiled from reports of health officers, clerks, etc.)*

Counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population of Michigan for 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	32	1	.13	0	Oakland.....	44,107	1	0	.23	0
Ionia.....	36,839	5	0	1.36	0	Wayne.....	327,808	21	1	.64	.03
Lenawee.....	48,634	4	0	.82	0						

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894.

TABLE 2.—*Exhibiting the reported number of outbreaks of Smallpox which began, the number which ended, and the number of outbreaks which were present, in each month of the year 1898, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began....	0	1	1	0	0	0	1	0	1	1	1	1	7
Number ended....	0	0	1	1	0	0	0	1	0	1	0	2	6
Number present..	0	1	2	1	0	0	1	1	1	2	2	3	-----

Number of outbreaks of smallpox in each month of the year 1898.—The last line of figures, in Table 2, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months.

The first line of figures in Table 3, shows the number of cases reported sick in any part of each month.

As some of the cases were sick longer than one month they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total of reported cases in 1898.

The last line of figures, in this table (3), shows the per cent the cases sick in each month are of the exact number of cases reported to this office for the year 1898.

TABLE 3.—*Exhibiting the number and per cent of cases of Smallpox in Michigan in each month during the year 1898. (Includes each case for which the time during which it existed, was stated in the reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases sick in any part of the month....	0	1	1	0	0	0	1	2	9	9	2	9
Per cent the cases sick in each month were of total reported cases.....	0	3.1	3.1	0	0	0	3.1	6.3	28.1	28.1	6.1	28.1

Source of contagium of cases of smallpox.—Of the thirty-two cases of smallpox reported during the year 1898, the local health officers reported the source of contagium as stated in the description of each outbreak in succeeding pages of this article.

Ages of greatest prevalence of, and mortality from smallpox.—The reports of local health officers in Michigan for the year 1898, gave the ages of twenty-seven persons who were sick with smallpox, and of one person who died of that disease. Table 4 represents, in certain age-groups, the numbers of cases and of deaths from smallpox; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of the cases in that group.

TABLE 4.—*Exhibiting, in certain age-groups, the number of cases and the number of deaths from Smallpox; and the per cent that the cases in each group were of all cases. —Compiled from all reports for the year 1898, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.									
Ages in groups of years.	All ages.	0 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.
No. of cases.....	*27	9	2	2	6	1	5	0	1	1
Per cent the cases in each group were of all cases.....	100	33.3	7.4	7.4	22.2	3.3	18.5	0	3.3	3.3
No. of deaths.....	1	0	0	0	1	0	0	0	0	0

*Does not include those cases or deaths where the age was not stated.

Table 3 shows that the greatest prevalence of smallpox in 1898, occurred in the months of September, October and December.

Table 4 shows that especially large numbers of cases of smallpox in

1898 occurred in persons of ages under 9, from 20 to 24, and from 30 to 34 years.

Smallpox in Ionia City.—In this outbreak the health officer reported the occurrence of five cases, four of which were varioloid. The source of contagium was reported as unknown; but supposed to have been from the pest-house where there had been cases of the disease two years previous to this outbreak, and where the first case had been in the habit of visiting often. No deaths occurred in this outbreak. The health officer reported that restrictive measures were successfully adopted. The first case was a female aged twenty-four years.

Smallpox in Seneca Township, Lenawee County.—In this outbreak there were four cases of the disease reported with no deaths. The patients were isolated and it was reported that all precautionary measures necessary to prevent the spread of the disease were taken. The patients were three males aged 2, 14 and 25 years, and one female 45 years.

Controversy arose as to the diagnosis of the disease, it being claimed by some parties that it was chicken-pox. G. H. Cattermole, M. D., Communicable Disease Inspector employed by this Board, was sent to investigate the outbreak and pronounced the disease smallpox. Doctor Cattermole's report of this outbreak follows:

Henry B. Baker, Secretary, Lansing, Michigan:

Dear Doctor—In accordance with instructions from you, I went to Morenci, Lenawee County, on the night of August 6, 1898, for the purpose of investigating an alleged outbreak of smallpox in Seneca Township, Lenawee County.

Sunday morning, August 7, I met B. F. Horton, Supervisor of Seneca Township, and Samuel Stevenson, M. D., health officer of the township. They gave me the following history of the smallpox outbreak in their jurisdiction:

A farmer by the name of Joseph Powell living near the north line of the township was taken sick about July 2, with a disease which was at first thought to be chicken-pox. He had been exposed to the so called cases of chicken-pox in the Turner family who lived in the vicinity of Adrian. Mr. Powell's condition grew worse, and a council of physicians, including the veteran health officer of Seneca Township, was held. They pronounced the disease smallpox. The family and all persons exposed were isolated, and not allowed to go at large for fourteen days from the time of exposure.

Powell's two-year-old boy came down with the disease about fourteen days after the father was taken sick. The child had been vaccinated three times during the week following the onset of the disease in the father; the vaccination did not "work," but the child had a very mild attack of the disease.

Among the persons exposed to Powell was a woman by the name of Mrs. Dan'l Van Sickle. She was isolated fourteen days and then released, but on the evening of that day she was taken ill, and now the case presents the appearance of varioloid at the tenth day—pustules drying down.

A boy by the name of Simpson came in contact with a niece of Mrs. Turner, while in Adrian; the young lady was said to have chicken-pox. Simpson went to work for Mr. Hayward who lived in Seneca Township. Later Simpson came down with the disease; he went home for a few days and then returned to work.

A boy (Eddie) fourteen years old, who was living with Mr. Hayward, was taken sick twelve days after Simpson first complained of being sick. At one time Eddie had a temperature of 105 degrees. He was quite sick and remained so for some time. He now shows hundreds of pock marks, but is well along in convalescence.

The neighbors of these people think the disease is chicken-pox and object to being isolated after exposure to the persons sick. The township board of health had so much opposition that they decided to ask aid of the State Board of Health.

In company with Doctor Stevenson I saw all the cases mentioned above with the exception of Simpson, who had left the township, and is probably now in the vicinity of Adrian.

When I saw Powell he presented the appearance of a person in the fifth or sixth week of an attack of confluent smallpox. His face and hands were completely covered with pock marks. He had an ugly abscess in the lobe of one ear. Large scabs were still showing about the *alæ nasi*. There are boils on both legs and on other parts of the body.

The Powell baby showed a discrete form of the disease of a very mild form.

Mrs. Van Sickle showed a discrete form of the disease, with numerous pock marks on the face, body, hands and feet; on the feet some of pocks were still in the pustular stage.

The boy (Eddie) at Hayward's was well along in convalescence, but showed a great many pits and marks on all parts of the body.

We also visited Mrs. C. E. Van Sickle, aged twenty, who had been sick one week. For the past two days she had shown some eruption on the hands and legs. She was taken with chill, followed by fever, and pain in head and back. Her eyes were much swollen, tongue coated, and pulse over 100 per minute, when I saw her. The eruption was papular, elevated in some places and gave the sensation of small shot under the skin when rubbed. I believed her to be coming down with smallpox.

Not one of the patients whom I saw had ever been vaccinated with the exception of the Powell baby, who had been vaccinated three times during the week following its exposure. But all other members of each household in which the disease had occurred could show good vaccination scars. This immunity of all vaccinated persons would of itself lead to the belief that the disease was smallpox.

There were not many other people in that neighborhood who had not been vaccinated at some time. But I recommended that the township board of health offer free vaccination to all exposed persons, to all persons not previously vaccinated, and to all persons who had not been successfully revaccinated within the past five years.

The board agreed to follow this advice, and decided to have the health officer isolate and attend to the necessities of the families where there was infection, so long as he thought there was danger of the disease spreading.

Yours very respectfully,
GEO. H. CATTERMOLÉ.

Lansing, Mich., August 11, 1898.

Varioloid in Royal Oak Village.—One case of varioloid was reported as having occurred in Royal Oak Village, Oakland County.

The patient was a male aged eighteen years. The source of contagium was not clearly traced; but was supposed to have been a blanket used by a smallpox patient in 1894, and which was recently used by the patient in this outbreak.

Smallpox in Ecorse Township, Wayne County.—In this outbreak there was but one case, which recovered. The patient was a male aged thirty-three years, and was said to have contracted the disease at Dunkirk, N. Y.

Smallpox in Detroit.—From this locality three outbreaks of smallpox resulting in twenty-five cases and one death were reported to this office. Twenty-one of these cases and the one death were reported to have occurred in the calendar year 1898, the other four cases were reported to have occurred in 1899, although forming part of an outbreak which began in 1898. The health officer reported that in each outbreak isolation and disinfection were enforced and that the disinfectants used were "formalin and fire." The reported source of contagium in the first outbreak was: "Brought from some place in Ohio by colored hotel waiter;" in the second outbreak, "not known" and the third outbreak, "probably from Ohio."

Study of the data relative to smallpox in 1898 discloses two unusual phenomena connected with the disease in that year: first, its very mild form, and second, its almost unprecedentedly low fatality rate, there having been but one death in thirty-two cases or, 3.1 per cent.

These peculiarities of the disease in 1898 were not confined to outbreaks in Michigan; but were noticeable in other States. This fact induced the following correspondence between the secretary of this Board and Walter Wyman, M. D., Supervising Surgeon-General of the U. S. Marine-Hospital Service. August 23, 1898, the secretary wrote to Doctor Wyman as follows:

"Dear Doctor Wyman—There is reported in this State an outbreak of smallpox which is very unusually mild in character, and difficult of diagnosis. Several physicians have insisted upon it that the disease is not smallpox but chicken-pox. But it occurs chiefly in adults like smallpox and not in children as in cases of chicken-pox. I notice that similar outbreaks are reported from other States, as for instance in your bulletin for August 12, pages 841 and 842. On page 842 is a table which, if it represents the truth, discloses a very remarkable condition of things throughout the U. S. I write to ask you how much of the low death-rate apparent in that table is real and how much of it is due to imperfect reports. On page 842 Surgeon R. E. Murray reports 2,500 cases in Lowndes County, and mentions only ten deaths. It hardly seems possible that smallpox could exist so extensively with only one death for each 250 cases. And throughout the table, beginning on page 842 and ending on page 844, the ratio of deaths to cases is exceedingly small. Have you reason to believe that the deaths are all reported, or that they are reported in as large a proportion as are the cases?"

"On pages 857-859 are the reports of cases and deaths from smallpox in foreign countries, and it is plain to see that there is no such small ratio of deaths to cases as reported in this country."

"In the New York State Board of Health Bulletin for June, 1898, is a report of fifty cases of smallpox with not a fatal case. It seems to me that the subject of smallpox in this country at the present time is worthy of very careful study. The disease is usually much more severe following the cold weather, culminating usually about May. Your

bulletin for August 12 shows it to have been since the first of January present in twenty-four States. The disease is so widespread and its mildness tends towards extreme carelessness, and in many States vaccination has been very much neglected, therefore, unless something unusual is done for its restriction, it seems to me probable that when cold weather comes, we may expect serious trouble with this disease throughout this country.

"Will you have the kindness to give me all the information you can on this subject?"

In reply to the secretary's letter, August 27, 1898, Doctor Wyman wrote:

"Henry B. Baker, M. D., Secretary State Board of Health, Lansing, Michigan.

"Sir—I have to acknowledge receipt of your letter of the 23d instant, relative to certain peculiarities in the mortality from smallpox, as disclosed by the 'Table of Smallpox in the United States,' etc., which is published weekly in the Public Health Reports.

"In reply to your question—'How much of the low death-rate apparent in that table is real and how much of it is due to imperfect reports?' I would state that although the reports are not as full as they would be were all cases and deaths occurring in the United States from smallpox reported promptly to this office, yet it is a notorious fact that the death-rate from variola in those localities—especially in the South—where smallpox existed last winter was extremely low.

"For example, the following figures of the smallpox outbreak in Jefferson County (including the city of Birmingham) Alabama, of which epidemic the Marine Hospital Service took charge early in January, 1898, show this to be a fact.

"From August, 1897, to January 4, 1898, there were in the county 406 cases of variola and fifteen deaths, and, altogether from August until March 10, 1898, there were 759 cases, with a mortality of 3.16 per cent. Among all these cases there were only twenty-three white persons who had the disease.

"During this same outbreak there were forty-three cases in the city of Talladega (a town some forty miles east of Birmingham) with no deaths.

"In Bartow County, Georgia, during about the same period, 'about' 200 cases with two deaths.

"Pinkard, Alabama, August 15, 1897—February, 1898, fifty cases with no deaths.

"In Georgia, there was also a low mortality.

"Atlanta had, from August 21, 1897, to January 17, 1898, 272 cases. Of these five were fatal. From that date to February 15, 1898, there were forty-seven cases and two deaths.

"Another epidemic of the same character was that in and around Middlesborough, Kentucky. Here previously to March 14, 1898, there had been upwards of 169 cases with only two deaths.

"The following taken from the report of the medical officer of this Service in charge at Middlesborough, Kentucky, may be of interest in this connection:

"Patients treated at smallpox hospitals.—Colored 76, white 37 (total 103); male 64, female 39, deaths 0.

"The following is also taken from this report:

"Throughout the epidemic the disease maintained a mildness so characteristic this year of epidemics of smallpox in other localities. The prodromic symptoms were slight, usually without a chill, the eruption was almost invariably of the discrete type, the fever low and often absent, and the complications few, consisting chiefly of an occasional abscess."

"The cases in New York State referred to by you were spread—as you have of course heard—by a traveling show. The Secretary of the New York State Board of Health's report (fifty cases, no deaths) is to be found in No. 28, page 715, current volume of the Public Health Reports.

"Another outbreak of smallpox in the south last winter, showing an extremely low mortality, was that in Pulaski County, Arkansas, where 110 cases occurred to May 20, 1898, and only one death.

"Other examples could be quoted of the low mortality of the variola epidemics of last winter, but these are sufficient to show that the low mortality referred to is not altogether a matter of imperfect reports.

"As regards the much higher mortality from smallpox in foreign countries as shown by the foreign mortality tables published in the Public Health Reports, here also allowance must be made for incomplete reports as by far the greater majority of foreign towns and cities forwarding reports to the Bureau, give no reports of morbidity, or what is more misleading still, do so irregularly, and not for consecutive periods of time. Consequently no great reliance can be placed on reports of cases in the foreign tables. The statement of mortality, however, is correct as far as it can be made up from reports received."

COWPOX (VACCINIA) IN MICHIGAN IN 1898.

On his postal card report of January 22, 1898, R. L. Bentley, M. D., Health Officer of Stanton City, reported to this office that cowpox was present in his jurisdiction.

January 25, 1898, the secretary wrote as follows to Doctor Bentley relative to this case:

"I notice on your weekly card report for January 22, that you report a disease that I am unable to make out its name. From your card I would think it read 'Cowpox.' I shall be glad to know if it is cowpox. If so, it is extremely rare in Michigan and of very

great interest. I shall be glad to have you write a careful history of the outbreak for publication. Has the disease been spread to other animals or to persons, and from persons to animals, etc.? What authority have you that the disease is cowpox? Has the diagnosis been proved by inoculation? I hope you will give me all the facts you may be able to secure. I shall be glad to have you send me one or two scabs. If the disease is cowpox, you and Mr. Hinds should confer with each other.

"I shall be glad to hear from you soon. The outbreak is of very great interest and I shall be glad to have all the information, etc., it is practicable for you to supply."

January 27, 1898, Doctor Bentley replied as follows to the secretary's letter:

"Yours of the 25th inst. received, and in reply will state that the disease of which you spoke was cowpox and I know of its rarity and for that reason I am interested.

"The patient is a farmer living two and one-half miles from the city and there are several cows which he has on his place and for which he has been caring some time and they have sores similar to his sores. I think he became inoculated from them as he has the sores in several places where there were scabs in the skin.

"When I last saw him the sores were in the first stages and the scab had not formed yet, but I heard from him this morning and he said they were drying up and scabbing over. I sent for a piece of the scab and will enclose to you as soon as received. I called it cowpox because he is an upright man and has never had any skin disease and told me about the cows and their sores, and the veterinary here has seen the sores but says he never saw anything like them.

"The sores on the man also look like vaccination marks and spread from small spots. The only thing against the diagnosis is that the cows have the sores nearly in every spot on the different animals, while I supposed the cowpox usually appeared on the udder, but I don't see why they could not inoculate themselves by scratching the sores. All the animals (cows) on the place have it now. I will investigate further and report and send you scab of animals and man if possible. I will give you a complete history of cases if they prove to be cowpox. Let me hear from you."

January 29, 1898, Doctor Bentley again wrote to the secretary enclosing scab from a sore of suspected cowpox patient.

February 1, 1898, in acknowledging receipt of Doctor Bentley's second letter, the secretary wrote:

"Please accept thanks for your letter of January 29, and the scab suspected of being cowpox. I know of no way of proving it is cowpox, just at present. If you know any one who has a calf they would like to try it on, I hope you will do so. Perhaps Mr. Hinds has some way of testing it. The disease seems to be communicable, whatever it is, and I shall hope to see your report of the history, etc."

No further information was received at this office relative to this subject.

CHICKEN-POX (VARICELLA) IN MICHIGAN IN 1898.

During the year ending December 31, 1898, the presence of chicken-pox at five localities in Michigan, was reported to the State Board of Health. Sixty-eight cases of the disease were reported to have occurred in three of those localities, as follows:

Portland Village, Ionia County, two cases; Grand Rapids City, sixty-five cases; Whiteford Township, Monroe County, one case. From Bellevue Village, Eaton County, Muskegon Heights, Kent County, and Adrian, Lenawee County, the presence of the disease was reported but the number of cases which occurred in those localities was not given by the health officers.

CONSUMPTION IN MICHIGAN—YEAR ENDING DECEMBER 31, 1898.

During the year ending December 31, 1898, there were reported to the Secretary of the State Board of Health 3,041 cases including 2,727 deaths from consumption in Michigan. These reports were received from 922 localities in the State. These numbers are probably less than the actual number of consumption-infected localities in Michigan, much less than the actual number of deaths, and very much less than the actual number of cases. Many cases are of long duration, and in the early stages and sometimes in the latest stages are not under the care of a physician; as a consequence many of these cases are not reported. From many localities only the deaths from consumption are reported; therefore the apparent ratio of deaths to cases is much too high.

CONSUMPTION IN 1898, COMPARED WITH PREVIOUS YEARS.

According to the reports made to the Secretary of the State Board of Health.—The compilation of information relative to the prevalence of consumption in Michigan, as reported to the office of the Secretary of the State Board of Health, was made for the first time for the year 1893. Table 1 shows the reported numbers of cases and deaths from consumption, the number of localities where the disease was reported present, the average numbers of cases and deaths per locality, and the deaths per 100 cases, for each of the years 1893-98.

TABLE 1.—CONSUMPTION IN MICHIGAN.—*Numbers of reported cases and deaths, number of localities in which they occurred, average number of cases and deaths per locality, and the per cent of cases which proved fatal, as reported for each of the 6 years, 1893-98.*

Year.	Reported localities.	Reported cases.	Average cases per locality.	Reported deaths.	Average deaths per locality.	Deaths per 100 cases.
1893.....	525	1,988	3.8	1,509	2.9	75.9
1894.....	590	2,060	3.5	1,581	2.7	76.7
1895.....	626	2,068	3.3	1,613	2.6	78.0
1896.....	512	2,198	4.3	1,454	2.8	66.2
1897.....	664	1,715	2.6	1,396	2.1	81.4
1898.....	922	3,041	3.3	2,727	3.0	89.7

According to the reports made to the Secretary of State.—The reports to the Secretary of the State Board of Health, while useful for many purposes, are not yet useful for comparing the deaths in one year with the deaths in another year, for the reasons already stated. On the other hand, not all deaths are reported to the Secretary of State, but probably the omissions are about the same in every year, therefore the statistics of the State Department are useful for comparing one year with another.

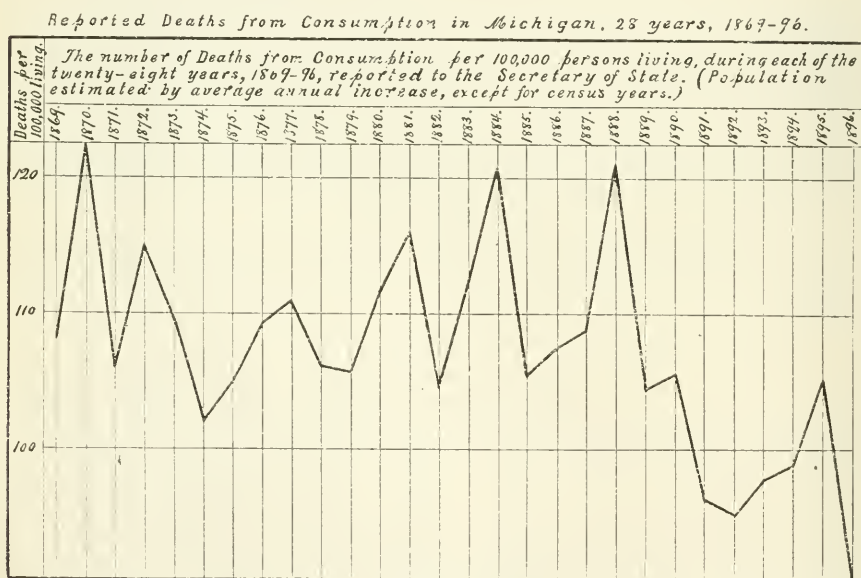
The following table (2) stating the number of deaths from consumption

per 100,000 persons living, reported to the Secretary of State, probably quite accurately represents the annual fluctuations of, but not the total deaths from consumption in Michigan during the twenty-eight years, 1869-96.

TABLE 2.—*Exhibiting the number of reported deaths from Consumption per 100,000 persons living in Michigan in each of the 28 years, 1869-96. Compiled from the Secretary of State's Vital Statistics of Michigan. (Population for intercensal years estimated by average annual increase based on National and State censuses.)*

Year.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.
Deaths.....	108.1	122.5	106.0	115.1	109.6	102.0	104.9	109.2	110.9	106.1	105.6	111.7	116.1	104.4
Year.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.
Deaths.....	112.3	120.8	105.3	107.3	108.7	121.0	104.3	105.4	96.3	95.2	97.7	98.4	105.1	90.4

The accompanying diagram (Plate 937) graphically represents the figures contained in Table 2.



[PLATE 937.]

Table 2 and accompanying diagram do not show the number of reported deaths from consumption for the year 1897, because the reports to the Secretary of State for that year have not yet been compiled. The reports for the year 1898, have been compiled, and the results of the compilation are available for use; but as the reports for that year were made under the new registration law, provided for by Act No. 217, Laws of 1897, the results of the compilation for that year are not comparable with results of compilations of reports made under the old law and shown in Table 2.

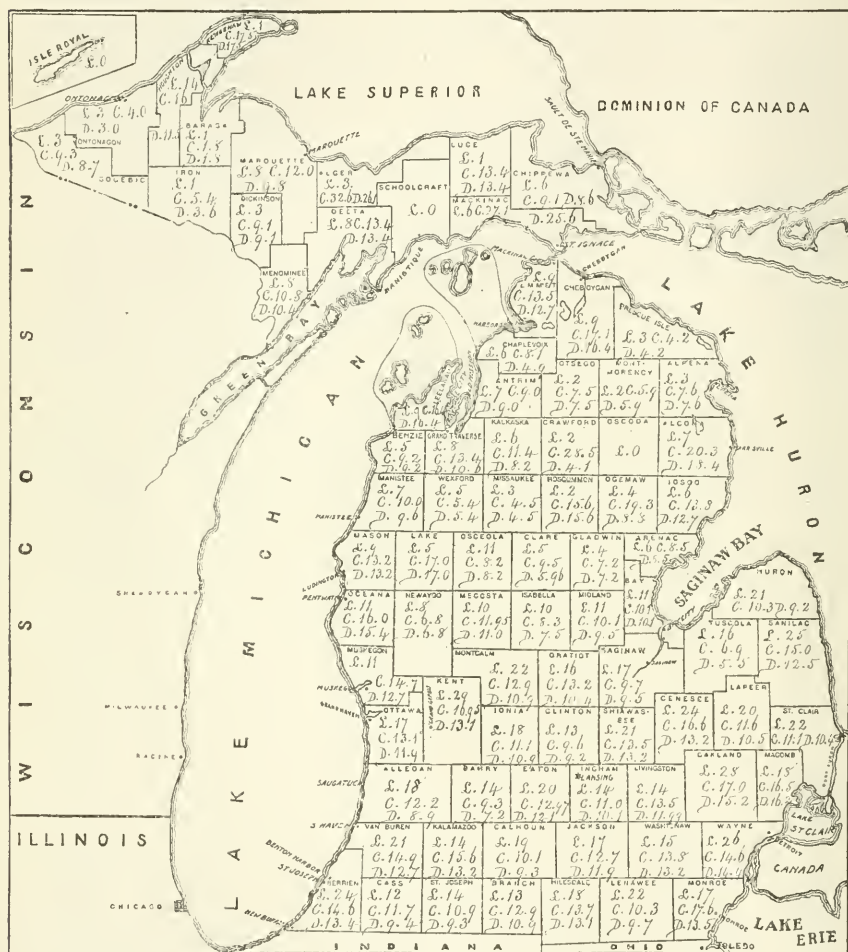
TABLE 3.—Numbers of cases and deaths reported from **Consumption** and the numbers of reported cases and deaths per 10,000 persons living in each county in Michigan during the year 1898. (Compiled from reports of health officers, etc.)

Counties.	Estimated population for 1898.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population for 1898.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State.....	2,389,393	3,041	2,727	12.73	11.41	Keweenaw....	2,851	5	5	17.54	17.54
						Lake.....	5,289	9	9	17.02	17.02
Alcona.....	5,427	11	10	20.27	18.43	Lapeer.....	28,545	33	30	11.56	10.51
Alger.....	1,582	5	4	32.64	26.11	Leelanau....	10,967	18	18	16.41	16.41
Allegan.....	39,417	48	35	12.18	8.88	Lenawee....	48,634	50	47	10.28	9.66
Alpena.....	19,853	15	15	7.56	7.56	Livingston...	20,016	27	24	13.49	11.99
Antrim.....	14,442	13	13	9.	9.	Luce.....	2,241	3	3	13.39	13.39
Arenac.....	8,203	7	7	8.53	8.53	Mackinac....	6,644	18	17	27.09	25.59
Baraga.....	5,428	1	1	1.84	1.84	Macomb.....	33,961	56	55	16.49	16.20
Barry.....	23,615	22	17	9.32	7.20	Manistee....	27,998	28	27	10.	9.64
Bay.....	66,196	67	67	10.12	10.12	Marquette....	39,936	48	39	12.02	9.77
Benzie.....	10,889	10	10	9.18	9.18	Mason.....	20,459	27	27	13.20	13.20
Berrien.....	49,985	73	67	14.60	13.40	Mecosta.....	21,761	26	24	11.95	11.03
Branch.....	25,623	33	28	12.88	10.93	Menominee...	24,947	27	26	10.82	10.42
Calhoun.....	51,443	52	48	10.11	9.33	Midland.....	15,779	16	15	10.14	9.51
Cass.....	21,399	25	20	11.68	9.35	Missaukee....	8,862	4	4	4.51	4.51
Charlevoix...	12,322	10	6	8.12	4.87	Monroe.....	34,025	60	46	17.63	13.52
Cheboygan...	15,814	27	26	17.07	16.44	Montcalm....	35,679	46	39	12.89	10.93
Chippewa....	18,625	17	16	9.13	8.60	Montmorency	3,389	2	2	5.90	5.90
Clare.....	8,394	8	5	9.53	5.96	Muskegon....	34,635	51	44	14.72	12.70
Clinton.....	26,015	25	24	9.61	9.23	Newaygo....	17,774	12	12	6.75	6.75
Crawford....	2,458	7	1	28.48	4.07	Oakland.....	44,107	75	67	17.00	15.19
Delta.....	23,194	31	31	13.37	13.37	Oceana.....	17,500	28	27	16.00	15.43
Dickinson...	15,448	14	14	9.06	9.06	Ogemaw.....	5,693	11	5	19.32	8.78
Eaton.....	33,142	43	40	12.97	12.07	Ontonagon...	9,960	4	3	4.00	3.00
Emmet.....	12,638	17	16	13.45	12.66	Osceola.....	18,320	15	15	8.19	8.19
Genesee.....	41,676	67	55	16.56	13.20	Oscoda.....	1,708	0	0	0	0
Gladwin.....	5,592	4	4	7.15	7.15	Otsego.....	5,316	4	4	7.52	7.52
Gogebie.....	15,000	14	13	9.33	8.67	Ottawa.....	42,808	56	51	13.08	11.91
G'd Traverse.	21,675	29	23	13.38	10.61	Presque Isle..	7,135	3	3	4.20	4.20
Gratiot.....	28,884	38	30	13.16	10.39	Rosecommon..	1,281	2	2	15.61	15.61
Hillsdale....	29,884	41	39	13.72	13.05	Saginaw.....	81,421	79	77	9.70	9.46
Houghton...	52,961	85	61	16.05	11.52	Sanilac.....	35,301	53	44	15.01	12.46
Huron.....	35,967	37	33	10.29	9.18	Schoolcraft..	8,436	0	0	0	0
Ingham.....	41,712	46	42	11.03	10.07	Shiawassee...	34,756	47	46	13.52	13.24
Ionia.....	36,839	41	40	11.13	10.86	St. Clair.....	56,537	63	59	11.14	10.44
Iosco.....	9,456	13	12	13.75	12.68	St. Joseph...	24,818	27	23	10.88	9.27
Iron.....	5,561	3	2	5.39	3.60	Tuscola.....	36,316	25	20	6.88	5.51
Isabella.....	24,094	20	18	8.30	7.48	Van Buren....	31,577	47	40	14.88	12.67
Jackson.....	48,039	61	57	12.70	11.87	Washtenaw..	44,808	62	59	13.84	13.17
Kalamazoo...	44,839	70	59	15.61	13.16	Wayne.....	327,808	479	471	14.61	14.37
Kalkaska....	6,120	7	5	11.44	8.17	Wexford.....	16,816	9	9	5.35	5.35
Kent.....	133,954	227	176	16.95	13.14						

*Population estimated by average annual increase (arithmetical method) based on U. S. Census of 1890 and the State Census of 1894. Computed in the office of the State Board of Health.

DISTRIBUTION OF CONSUMPTION IN MICHIGAN IN 1898:

BY COUNTIES, THE REPORTED CASES AND DEATHS PER 10,000 INHABITANTS, INCLUDES ALL SUCH DEATHS REPORTED TO THE STATE DEPARTMENT.



L. = Localities; C. = Cases per 10,000 population; D. = Deaths per 10,000 population.

[PLATE 1038.]

Registration reports to the Secretary of State made under the new law, and the deaths therein reported classified by the Bertillon system, show that in 1898 there occurred in Michigan 2,153 deaths from consumption—tuberculosis of lungs,—a death-rate from that disease of 91.5 per 100,000 of population.

By Table 2, and more readily by the diagram (Plate 937) it may be seen that there was a remarkable and unprecedented decrease in the death-rate from consumption in Michigan in 1891, compared with any previous year; it was the first time that the disease had ever decreased so much, and the decrease occurred at a time when influenza was epidemic in

this country, and the statistics for the Eastern States show an increase in the death-rate from consumption, which increase was attributed to the influence of the epidemic influenza.

Possible causes for the above-mentioned decrease in consumption in Michigan, are explained in the annual report of this Board for 1898, page 319.

Sickness-rates from reported consumption in 1898.—Table 3 shows the reported sickness and sickness-rates from consumption by counties in the State. For reasons explained in the first paragraph of this article little reliance can be placed on the completeness of the reports of *sickness* on which these sickness-rates are based.

Death-rates from reported consumption in 1898.—Table 3 shows that the death-rate from consumption reported for the whole State in 1898 was 11.41 deaths per 10,000 persons living in the State. The county having the highest death-rate (26.11 deaths per 10,000 of population) was Alger. That having the lowest death-rate (1.84) was Baraga. From two counties—Oscoda and Schoolcraft, no deaths from consumption were reported.

TABLE 4.—*Exhibiting, by months, the number of deaths from Consumption that were reported to have occurred in Michigan in the year, 1898; also the average for the five years, 1894–98. (Compiled from such reports to the State Board of Health, as stated the time of death.)*

Year.	Total number.	Number of deaths for each month.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1898	2,632	214	234	239	259	254	224	172	209	186	222	190	229
Av. 5 years, 1894–98..	1,069	81	80	78	92	94	78	66	79	71	108	113	128

Table 4 shows that in 1898, as compared with the average for the five years 1894–8, there was a large apparent increase in the number of deaths from consumption. This apparent increase may not be real, but due to a larger proportion of the actual deaths being reported since the new registration law became operative, as, in addition to the deaths reported directly to this office, others reported to the Secretary of State, of which we have not been notified by health officers, are received at this office from the bureau of Vital Statistics in the State Department.

Source of contagium of consumption.—Of the 3,041 cases of consumption reported during the year 1898, the local health officers reported the source of contagium as follows: Traced to a former case, 146; reported as inherited, 166; attributed to “taking cold” or “exposure,” 175; attributed to “la grippe,” etc., 211; attributed to contagium from outside of jurisdiction, 10; unknown or indefinitely reported, 621; cows milk, 4; source not reported, 1,708; total, 3,041.

How consumption is most commonly spread.—The tubercle bacillus, the specific cause of consumption, is found in an active state in the sputa from the lungs of persons suffering from that disease. The dust of dried tubercular sputum, when inhaled by susceptible persons, is thought to be the most common way of transmitting pulmonary consumption from person to person. The members of a family or household in which there is a consumptive person may be constantly exposed to the danger of in-

fection, unless the sputa are carefully collected and destroyed. The object of much of the work done by the State Board of Health is to cause the destruction of infected sputa, and to educate the people in this simple means of restricting the spread of consumption.

Ages of greatest prevalence of, and mortality from, consumption.—In Table 5 are shown the numbers of cases and deaths from consumption in Michigan in 1898, in which the ages were stated in the health officers' reports. In this table the cases and deaths are arranged in *age-groups*, showing what per cent the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; the per cent the deaths in each group were of the cases in that group, and the per cent the deaths in principal groups were of all deaths.

From Tables 6 and 7 it may be seen that there were 544 more deaths reported from consumption among females than among males (where age and sex were stated in the reports), during the years 1894-98.

Table 7 shows that the highest per cent of reported deaths, for each sex, occurred in the age-period from 20 to 29 years. The average age at

TABLE 5.—*Exhibiting, by sex, in certain age-groups, the number of cases and the number of deaths from Consumption; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; and the per cent that the deaths in each group were of the cases in that group. Compiled from all reports for the year 1898 which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																	
Ages in groups of years.	Sex.	All known ages.*	Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 to 64.	65 to 69.	70 to 74.	75 years and over.	
No. of cases..	Males...	1,230	51	15	83	176	164	176	125	84	81	91	71	51	45	42	35	
	Females	1,532	73	47	182	257	222	184	144	100	65	69	53	43	50	24	19	
Per cent the cases in each group were of all cases of known ages..	Males...	100	4.1	1.2	6.7	14.3	13.3	10.2	10.2	6.8	6.6	7.4	5.8	4.1	3.7	3.4	2.8	
	Females	100	4.8	3.1	11.9	16.8	14.5	12.0	9.4	6.5	4.2	4.5	3.5	2.8	3.3	1.6	1.2	
No. of deaths..	Males...	1,162	51	13	77	168	156	106	110	78	78	88	67	50	44	42	34	
	Females	1,440	71	43	171	245	202	173	137	92	62	64	50	43	47	22	18	
Per cent the deaths in each group were of cases in that group...	Males...	94.5	100	86.6	92.8	95.5	95.1	84.1	88.0	92.9	96.3	96.7	94.4	98.0	97.8	100	97.1	
	Females	94.0	97.3	91.5	94.0	95.3	91.0	94.0	95.1	92.0	95.4	96.7	92.8	100	94.0	91.7	94.7	
Per cent the deaths in each group were of all deaths at known ages..	Males...	100	4.4	1.1	6.6	14.5	13.4	9.1	9.5	6.7	6.7	7.6	5.8	4.3	3.8	3.6	2.9	
	Females	100	4.9	3.0	11.9	17.0	14.0	12.0	9.5	6.4	4.3	4.4	3.5	3.0	3.3	1.5	1.3	
Per cent the deaths in special groups were of all deaths at known ages..	Males...	-----	5.5			31.5			25.3					34.7				
	Females	-----	7.9			42.9			27.9					21.3				

*Does not include those cases or deaths where the age was not stated.

death during the five years 1894-98 was for males 37.0 and for females 32.3 years, or 4.7 years more for males than for females. In determining these averages, the deaths of 1,885 males and 2,429 females are considered.

TABLE 6.—*Exhibiting, by sex, the ages of 4,314 persons who died of Consumption, during the years 1894-8. (Compiled from such reports to the State Board of Health, as stated sex and age.)*

Year.	1897.			1898.			Total 5 years, 1894-8.			Av. 5 years, 1894-8.	
	Males.	Females.	Totals.	Males.	Females.	Totals.	Males.	Females.	Totals.	Males.	Females.
10 years and under.....	10	12	22	51	71	122	70	93	163	14	19
10 to 20 years.....	44	74	118	90	214	304	171	385	556	34	77
20 to 30 ".....	116	131	247	324	447	771	538	746	1,284	108	149
30 to 40 ".....	94	118	212	216	310	526	389	550	939	78	110
40 to 50 ".....	58	56	114	156	154	310	250	270	520	50	54
50 to 60 ".....	35	35	70	155	114	269	217	175	392	43	35
60 to 70 ".....	32	26	58	94	90	184	144	149	293	29	30
70 to 80 ".....	17	10	27	63	32	95	90	53	143	18	11
Over 80 ".....	0	0	0	13	8	21	16	8	24	3	2
	406	462	868	1,162	1,440	2,602	1,885	2,429	4,314	377	486

TABLE 7.—*Exhibiting, by sex and in certain age-groups, the per cent of persons who died from Consumption in Michigan, during the year 1898, and the average of the same for the years 1894-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from consumption.													
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.									
				All ages.	Under ten years.	10 to 19.	20 to 29.	30 to 39.	40 to 49.	50 to 59.	60 to 69.	70 to 79.	Over 80 years.
1898.	Males.....	37.9	1,162	100	4	8	28	19	13	13	8	5	1
	Females.....	32.6	1,440	100	5	15	31	22	11	8	6	2	0.6
1894-8.	Males.....	37.0	1,885	100	4	9	29	21	13	12	8	5	0.8
	Females.....	32.3	2,429	100	4	16	31	23	11	7	6	2	0.3

Duration of consumption.—Fatal and non-fatal cases.—By Table 8, it may be seen that from reports received during the years 1894-8, which stated the interval between the time of being taken sick and the time of death from consumption, the largest per cent for both males and females occurred in the first year of sickness. The next highest per cent of deaths occurred in the second (1 to 2) year of sickness, and as the duration of

eight in 1898; they are tabulated below according to sex, age and duration:—

Sex.	Age.	Duration.	Sex.	Age.	Duration.
Males.....	14 years.	Not stated.	Females..	21 years.	2 years and 8 months.
	18 years.	7 months.		19 years.	5 months.
	27 years.	4 months.		35 years.	3 months.
	Not stated.	3 years and 10 months.		Not stated.	1 year.
	41 years.	Not stated.		37 years.	2 months.
	19 years.	7 months.		20 years.	Not stated.
	27 years.	8 months.		22 years.	Not stated.
	29 years.	1 year.		16 years.	Not stated.
	26 years.	4 months.		36 years.	9 months.
	34 years.	Not stated.		Not stated.	Not stated.
	26 years.	Not stated.		35 years.	3 months.
	35 years.	2 years.		20 years.	2 months.
	47 years.	3 months.		42 years.	8 months.
	35 years.	1 month.		30 years.	Not stated.
	42 years.	1 year.			
	Not stated.	Not stated.			
	Not stated.	Not stated.			
	24 years.	16 months.			
	35 years.	Not stated.			
	35 years.	23 months.			
	21 years.	10 months.			
Sex, age and duration not stated in six of the cases reported as having recovered.					

The average age of the eighteen male cases, where the ages were stated, was 29.7 years; of the twelve female cases, 27.8 years.

The average duration of sickness, where the time was stated was for males, 12.6 months; for females, 8.4 months.

Information contained in final reports of cases of consumption during the years 1895-8.—For the year 1895, 42 final reports of fatal cases of consumption in Michigan, were received at this office; for 1896 there were 137, for 1897 there were 457, and for 1898, 1,872 such final reports received relative to fatal cases of consumption. The information contained in these 2,508 reports, for the four years, is combined and summarized below.

Of the 3,748 consumptives of whom the sex was stated, 1,682 were males and 2,066 were females.

Of 3,495 consumptives of whom the color was stated 3,399 were white, 56 black (negroes) and 40 red (indians).

The complexion of 1,683 consumptives was stated as: Black 8, dark 593, light 1,082.

Color of hair was stated in 1,679 instances as: Black 109, dark 679, brown 191, auburn 198, light 477, white or gray 25.

Location of the disease, reported in 1,862 instances.

Lungs.....	1,532	Mesenteric gland.....	2	Heart.....	1
Bowels.....	47	Lungs and bladder.....	2	Lungs, stomach and liver..	1
Lungs and bowels.....	37	Abscess in back.....	2	Lungs and chest.....	1
Chest.....	29	Lungs and glands.....	2	Lungs, abdomen and blad-	
Lungs and throat.....	28	Lungs, stomach and bowels	2	der.....	1
Throat.....	22	Leg.....	2	Heart, lungs and liver....	1
General.....	17	Face and lungs.....	2	Lungs and thorax.....	1
Bronchi.....	14	Womb.....	2	Hip joint.....	1
Larynx.....	11	Spine.....	2	Hip joint and lungs.....	1
Stomach.....	10	Peritoneum.....	2	Bowels, lungs and larynx..	1
Thorax.....	7	Kidney.....	1	Thigh, hip and kidney....	1
Liver.....	7	Inguinal.....	1	Lungs, liver and kidney...	1
Stomach and bowels.....	6	Ovaries.....	1	Lungs and pleural cavity..	1
Lungs and abdomen.....	6	Spleen.....	1	Head and lungs.....	1
Left side.....	5	Alimentary canal.....	1	Kidney, spleen and liver..	1
Lungs and bronchi.....	5	Liver and bowels.....	1	Lungs and rectum.....	1
Brain.....	5	Back and hips.....	1	Glands and bowels.....	1
Lungs and larynx.....	5	Bowels and bronchi.....	1	Lungs, peritoneum and	
Lungs and stomach.....	4	Stomach and bronchi.....	1	brain.....	1
Lungs and liver.....	4	Liver, lungs and spleen...	1	Liver, stomach and bowels	1
Lungs, bowels and kidney..	3	Fibrous.....	1	Heart and kidney.....	1
Lungs and peritoneum....	3	Throat and kidneys.....	1		
Larynx and bronchi.....	3	Glands and neck.....	1		

Of the civil condition of 2,263 consumptives 1,298 were reported as married, 904 single, and 61 as widows or widowers.

Of 1,594 replies given in the reports to the question, were sputa of consumptives bacteriologically examined, 1,208 were "no" and 386 "yes."

To the question, were discharges from the bowels of consumptives bacteriologically examined, there were 1,359 answers, all in the negative.

In answer to the question, were persons or animals infected from this patient, in 38 instances the reply was "yes." In 1898, twenty-seven persons and three animals were reported to have taken the disease from consumptives.

Results of bacteriological examinations of sputa of alleged consumptives in Michigan, in 1898.—As previously stated in this article, 386 affirmative replies were given to the question, "Was the sputum of the patient bacteriologically examined for the bacillus tuberculosis?" Relative to the results of these examinations only 244 positive statements were made. In 228 instances bacilli tuberculosis were reported to have been found in the sputa. In sixteen instances the result was reported negative, no bacilli having been found; thus showing that the results in about 93 per cent of the examinations were positive and in only about 7 per cent were negative.

In the annual report of the State Board of Health of Rhode Island

Consumptive relatives, reported in 767 instances.

Sister.....	131	Mother and aunt.....	2	Father, mother, sister and	
Mother.....	108	Grandmother, aunt and		brother.....	1
Brother.....	76	cousin.....	2	Aunt and grandmother....	1
Father.....	67	Two brothers and daughter	2	Wife and son.....	1
Daughter.....	37	Great aunt.....	2	Cousin and aunt.....	1
Brother and sister.....	30	Uncles and aunt.....	2	Father and uncle.....	1
Aunt.....	27	Half-sister.....	2	Grandmother and uncle ...	1
Wife.....	24	Brother and four sisters....	2	Mother-in-law	1
Grandparents.....	23	Brother and husband.....	1	Sister, cousin and wife....	1
Husband.....	23	Parents and aunt.....	1	Father, three sisters and	
Mother and sister.....	21	Great-grandmother, uncle		brother.....	1
Cousin.....	20	and aunt.....	1	Cousin, aunt, father and	
Uncle.....	20	Mother and son.....	1	sister.....	1
Father and mother.....	18	Mother and wife.....	1	Husband and sister.....	1
Father and brother.....	16	Granddaughter.....	1	Mother, brother and half-	
Father and sister.....	14	Sister and niece.....	1	brother.....	1
Son.....	10	Mother and cousin.....	1	Twin brother.....	1
Mother and brother.....	9	Brother and cousin.....	1	Father and wife.....	1
Niece.....	6	Nephew.....	1	Grandmother and wife....	1
Wife and daughter.....	5	Sister, uncle, mother and		Daughter, mother and	
Father, mother and sister..	5	aunts.....	1	uncle.....	1
Mother, sister and brother.	4	Grandfather and father....	1	Two children of a sister...	1
Father and cousin.....	4	Grandmother and father....	1	Stepfather.....	1
Two sons and daughter....	4	Sister and daughter.....	1	Great-grandmother.....	1
Sister and husband....	3	Three sisters and father....	1	Cousin and nephew.....	1
Father, brother and sister..	3	Mother and two sisters....	1	Wife, mother and cousin..	1
Brother-in-law	3	Second cousin	1	Aunt and sister.....	1
Husband and daughter....	2	Two half-sisters.....	1		

for 1897 (page 137), it is stated that in 344 examinations of the sputa of alleged consumptives in that state, in 1897, bacilli tuberculosis were found in only 179 specimens, or about 52 per cent of the specimens submitted to examination.

Tuberculosis probably communicated from mother to daughter.—A. J. McLaughlin, M. D., Health Officer of Berrien Springs Village, Berrien County, reporting to this office September 22, 1898, relative to a case of consumption, wrote as follows:

"In regard to the enclosed report on the death of S. B. H., of consumption, I would say that she came to Berrien Springs from somewhere in Royalton Township last April, that she presented the picture of phthisis pulmonalis. I made that diagnosis the first morning I saw her. Her physician in Royalton insisted that she had *no consumption*. I, however, confirmed my diagnosis with the microscope and reported to you. Every precaution has been taken since she came under my care in this village, just as recommended by you; but before coming here no sanitary precautions were used whatever in Royalton.

"She became so weak in November, 1897, that she considered herself sick and called her physician. She had been losing flesh for a year before this (November, 1897). Although she impressed on her doctor the symptoms of hacking cough, progressive emaciation and night sweats, he said her lungs were sound, and allowed her daughter, at that time a strong, healthy young girl, to sleep with her. The mother kept getting

Consumptive associates were reported in 435 instances, as follows:

Sister.....	75	Mother, brother and sister..	3	Sister, cousin and wife.....	1
Mother.....	50	Sister-in-law.....	3	Grandfather.....	1
Brother.....	45	Family.....	2	Grandmother and uncle....	1
Father.....	30	Wife and sister.....	2	Two sons and daughter....	1
Daughters.....	23	Aunt and mother.....	2	Father, mother, sister and	
Wife.....	22	Uncle.....	2	brother.....	1
Husband.....	21	Mother-in-law.....	2	Second cousin.....	1
Brother and sister.....	19	Father and grandmother...	2	Two brothers and daughter	1
Mother and sister.....	14	Half-sister.....	2	Relative by marriage.....	1
Mother and father.....	10	Son and daughter.....	2	Father and grandfather....	1
Father and sister.....	10	Father, brother and sister..	2	Sister, uncle, mother and	
Father and brother.....	8	Parents and aunt.....	1	aunt.....	1
Aunt.....	7	Mother and wife.....	1	Aunt and sister.....	1
Cousin.....	7	Stepmother.....	1	Mother, sister, wife and	
Son.....	6	Brother and husband.....	1	children.....	1
Brother and mother.....	6	Brother and two nieces....	1	Father, mother and cousin..	1
Grandmother.....	5	Sister and husband.....	1	Ladies in hospital.....	1
Friend.....	4	Mother and cousin.....	1	Schoolmate.....	1
Wife and daughter.....	4	Brother and cousin.....	1	Father and wife.....	1
Brother-in-law.....	4	Husband and daughter-in-		Mother and two brothers..	1
Father, mother and sister..	4	law.....	1	Husband and two daughters	1
Niece.....	4	Sister and daughter.....	1	Daughter, mother and uncle	1
Neighbor.....	3	Patients.....	1		

worse, and in January the daughter began to cough, had a hemorrhage from the lungs, and died of 'quick' consumption, April 2, 1898. This looks to me like a clear case of direct infection in a case with possibly some hereditary predisposition. If, when the mother was taken sick, proper precautions had been taken to disinfect the sputa, etc., and the daughter had been kept away from the mother, instead of being allowed to breathe the air of that ill-ventilated, dirty sick room, in the *same bed with her*, I think the girl would be alive and strong today.

"We only disinfected one room here because she only occupied one room since being here."

The mother referred to in Dr. McLaughlan's letter died in Berrien Springs, August 29, 1898, and the daughter died in Stevensville Village, April 2, 1898. Immediate cause of daughter's death was reported hepatization of the lungs.

Cases of consumption believed to be directly traceable to previous cases.—Frank W. Moats, Health Officer of Sheridan Township, Calhoun County, reporting to this office relative to a case of consumption in his jurisdiction that was taken sick May, 1897, and died June 18, 1898, stated that the patient contracted the disease by association with her brother who died of it in May, 1897. Health Officer Moats also reported that a sister of the two decedents above mentioned, and who lived with them, was taken sick with the disease June 21, 1898, and died April 19, 1899.

M. Holland, M. D., Health Officer, of Cassopolis Village, Cass County, March 23, reported to this office the death, from consumption, of a young man in his jurisdiction. Dr. Holland stated in his report that the decedent at the time of contracting the disease was closely associated with

Occupation of consumptives, reported in 2,105 instances.

Housewife.....	565	Cigarmaker.....	11	Lumber-dealer.....	3
Farming.....	387	Blacksmith.....	11	Agent.....	3
Laborer.....	282	Telegraph operator.....	10	Watchman.....	2
Domestic servant.....	185	Teamster.....	9	Gambler.....	2
Housekeeping.....	123	Tailor.....	8	Drayman.....	2
Student.....	110	Cook.....	8	Hotelkeeper.....	2
Clerk.....	48	Engineer.....	6	Lumber-scaler.....	2
School teacher.....	47	Barber.....	6	Grocer.....	2
Milliner and dressmaker....	37	Woodman.....	5	Shiptender.....	1
Carpenter.....	26	Druggist.....	5	Artist.....	1
Merchant.....	24	Butcher.....	4	Candymaker.....	1
Accountant and cashier....	23	Doctor.....	4	Mill hand.....	1
Miner.....	16	Minister.....	4	Cutter.....	1
Saloonkeeper.....	15	Boommen.....	4	Designer.....	1
Railroad men.....	15	Nurse.....	3	Dealer in wool and hides...	1
Machinist.....	13	Commercial traveler.....	3	Moulder.....	1
Mason.....	13	Photographer.....	3	Foreman.....	1
Printer.....	12	Baker.....	3	Brewer.....	1
Painter.....	11	Stenographer.....	3	Buttermaker.....	1
Shoemaker.....	11	Fisherman.....	3		

The method of disinfection of sputa and soiled articles was mentioned in 1,162 instances, as follows :

Burned.....	768	Boiled and sulphur fumes...	6	Bichloride and buried.....	1
Carbolic acid.....	88	Washing.....	5	Chloride and sulphur fumes	1
Chloride of lime.....	37	Bichloride solution.....	5	Lime and boiling.....	1
Buried.....	32	Heating and sulphur fumes.	4	Heat and formaldehyde...	1
Sulphur fumes.....	25	Carbolic acid and boiling		Potash.....	1
Boiled.....	25	water.....	2	Sulphur and formaldehyde.	1
Ashes.....	18	Lime and burning.....	2	Zinc and sulphur.....	1
Boiled and burned.....	12	Washing and sulphur fumes.	2	Bichloride of mercury and	
Bichloride of mercury.....	12	Boiling and burying.....	2	carbolic acid.....	1
Formaldehyde.....	10	Carbolic acid and lime.....	2	Lime and zinc.....	1
Copperas.....	9	Disinfectant solution.....	2	Sulphate of iron and burned	1
Disinfected.....	8	Ashes and lime.....	2	Burning and mercury.....	1
Chloride solution.....	8	Burning and sulphur fumes.	1	Creolin and boiling water..	1
Platt's chloride.....	7	Burning and zinc sulphate..	1	Antiseptic paper burned...	1
Zinc.....	7	Boiling and zinc.....	1	Not disinfected.....	46

a brother and sisters who were then suffering from, and subsequently died of consumption. Dr. Holland reported, also, that the mother of the young man above referred to, and who attended him during the last stages of his illness, contracted the disease and died of it nine or ten weeks after her son's death.

W. I. St. John, M. D., Health Officer of Highland Township, Oakland County, in his final report relative to a case of consumption in his jurisdiction, relates the following facts in regard to the case: The patient, a young lady teacher aged 23 years, entered Grace Hospital for treatment of her eyes. While an inmate of said hospital she associated with other patients who were suffering from tuberculosis. About three months after leaving the hospital she became sick and ultimately died of consumption.

Spread of consumption probably due to neglect of restrictive measures.—Dr. W. C. McCutcheon, of Cassopolis Village, wrote as follows to the secretary of this Board, August 18, 1898, relative to consumption:

"Is there no way by which physicians are compelled to report to the health officers contagious diseases occurring in their practice? I know to my certain knowledge of a young lady, at present a victim of pulmonary phthisis, who contracted the same by her parents moving into a house in which a lady had six months previous died of consumption. The girl occupied the same room as deceased, which had not been disinfected nor even repapered. The girl was in a debilitated condition, and as a result she now has tuberculosis.

"This is a case about which there is in my mind, not a vestige of doubt."

August 20, 1898, in a letter to the secretary, Dr. McCutcheon mentions another instance of a life lost by consumption, which he believes might have been saved if proper sanitary measures had been adopted. Following is an extract from Dr. McCutcheon's letter:

"Since writing you I have gleaned some facts in another case of tuberculosis which I am treating. Mrs. E——, aged 29, helped nurse and care for Mrs. A——, who died of tuberculosis pulmonalis some time in the autumn of 1897. She nursed the case about two weeks towards the end of her illness. In the early spring she was taken sick with an attack of la grippe with bronchitis. From this she did not make a good recovery, a persistent hacking cough remaining, with scanty expectoration, gradually becoming more profuse. About six weeks ago I made an examination of the sputa and found it abounded with bacilli tuberculosis.

"Now this is a case which I think might have been saved had proper sanitary precautions been taken in the case of Mrs. A——. She was permitted to expectorate into handkerchiefs, etc., and no antiseptic precautions were taken in her case whatever. The case was not even reported to our local health officer, nor was he aware of the facts in the case until apprised of the same from yourself. I am satisfied Mrs. E——'s hopeless condition is due to the negligence of some person which it seems to me approaches very near to criminal."

Consumption with contagion not traced.—Edward Batwell, M. D., Health Officer of Ypsilanti City, reported to this office the death of a lady in his jurisdiction from consumption. Of the source of contagium in this case, Dr. Batwell wrote:

"The following notes may be of some interest. I think it was in, or about, September, 1897, I was sent for to see C—— T——, who had taken cold and 'had a bad cough.' I went and found that his wife and daughter were in the same condition, *having been taken down at the same time*. A few days attendance satisfied me that I had three cases of acute phthisis, and that all would prove fatal. I continued to treat them and the father died in two months, the daughter three months later, and the mother February 7. It was the most rapid development of tubercular disease I ever saw. There never was a case of consumption in their families. They were *extra neat* in their household affairs and in their persons. No one ever had consumption in the house, nor had they a consumptive acquaintance. I am satisfied contagion had nothing to do with it. They were strong, robust, hard workers and healthy till taken down as described above. The surviving daughter is healthy and strong."

Bowel discharges were disposed of in 1,426 instances, as follows:

Buried	390	Ashes.....	11	Sulphate of iron.....	2
Privy.....	286	Carbolic acid.....	10	Disinfection and privy.....	2
Vault	221	Carried away.....	8	Disinfection and buried....	2
Closet.....	113	Chloride	6	Destroyed.....	2
Disinfected	89	Copperas	6	Lime and sulphur.....	1
Burned.....	87	Buried and lime.....	4	Bichloride and privy.....	1
Sewer.....	73	Privy and ashes.....	3	Bichloride and lime.....	1
Ground.....	52	Zinc solution.....	3	Privy and lime.....	1
Lime.....	31	Bichloride of mercury.....	3	Privy and disinfection.....	1
Scalded or boiled.....	14	Cesspool	3		

In 1897 and 1898, reports to this office contained information relative to beginning of sickness of consumptives as follows:

Disease was stated to have begun in 1,328 instances with—

Bad cold.....	630	Whooping-cough.....	4	Nervous prostration.....	1
Influenza.....	177	Throat.....	3	Hay fever.....	1
Bronchitis.....	149	Laryngitis	3	Typhoid and bronchitis.....	1
Hemorrhage.....	99	Diarrhea.....	3	Scarlet fever.....	1
Pneumonia	85	From birth.....	3	Cholera infantum.....	1
Grippe.....	36	Dyspepsia.....	2	Vomiting.....	1
Cough.....	23	Lumbago	2	Typhoid fever and asthma..	1
Wasting away.....	20	Bowels.....	2	Remittent fever.....	1
Catarrh.....	14	Congestion of liver.....	2	Measles and whooping-	
Typhoid fever.....	11	Congestion of lungs.....	2	cough	1
Malarial fever.....	7	Debility.....	2	Chills.....	1
After measles.....	6	Abscess.....	2	Softening of brain.....	1
Pleurisy.....	6	Exposure	2	Abdomen	1
Childbirth.....	5	Lungs.....	2	Heart	1
Asthma and heart trouble..	5	Lung fever	2	Inherited.....	1
Pain in side and lungs.....	4	Brain fever.....	1		

Nationalities of consumptives, reported in 2,150 instances.

American.....	1,237	Polish.....	21	Swiss.....	2
German.....	308	Finnish.....	18	Welsh.....	1
Irish.....	119	Norwegian	10	Assyrian	1
Canadian.....	113	Nova Scotian.....	8	Scandinavian.....	1
Dutch.....	69	Austrian.....	7	Russian.....	1
English.....	65	Belgian	6	Australian	1
French.....	62	Danish	6	Italian.....	1
Swedish	46	Caucasian	5	Greek	1
Scotch.....	37	Bohemian.....	4		

PNEUMONIA IN MICHIGAN IN 1898.

During the year 1898, reports relative to four cases and one death from pneumonia were received at this office from four localities, as follows: Inland Township, Benzie County, one case; Eckford Township, Calhoun County, one case; Brookfield Township, Eaton County, one fatal case, and Chelsea, Washtenaw County, one case.

The above-mentioned are all the individual cases of pneumonia which were reported to this office during the year; but they do not constitute the whole amount of sickness from this disease in the State during this period. Reference to Exhibit I, page 63, of the article on "Sickness Statistics" in this report shows that of the 5,219 weekly card reports received at this office during the year, 17 per cent stated the presence of pneumonia in some localities in the State. The Vital Statistics Bulletins, compiled in the State Department, indicate that in 1898 pneumonia caused more deaths in Michigan than consumption or any other disease; but the final compilation shows consumption to have caused most deaths.

TUBERCULOSIS IN BEEF.

July 29, 1898, W. H. Atterbury, Health Officer of Litchfield Village, wrote to the secretary of this Board as follows:

"I was called this noon to inspect a beef which was killed this a. m. at slaughter-house. It was a heifer about five to six years old. Covering the skin on inside were thousands of small tumor-like growths varying in size from pin head to size of a fist. Were most thick around skirt and attachment to sides and back, and running back towards rump less in number. Same growth covered lungs. Was unable to see lungs as they were thrown out immediately to hogs.

"From close questioning could not learn that any other organs were affected by same growth.

"Will mail you specimen with this letter, and let me hear from you soon as possible. Will hold beef till get a report from you. In other respects seemed perfectly healthy, also did when alive.

"One specimen you will notice in lining next to the ribs and growth is only on one side. Side next flesh is very clean."

In reply to Health Officer Atterbury's letter, July 30, 1898, the secretary wrote:

"Your letter of July 29 relative to diseased meat is before me, and also the sample of tubercles which you sent. As I informed you by telephone, I turned the sample over to an expert for examination, and he finds the bacilli of tuberculosis present in the tubercles. As I also informed you by telephone it is your duty as health officer to take immediate steps to protect the people; and I have written to Hon. J. H. Brown, member of State Live Stock Commission, Climax, Michigan, who will attend to the protection of the animals. But as you will see by our pamphlet [120] it is the duty of local health officials to serve in that regard until relieved by the State Live Stock Commission."

MUMPS (PAROTITIS) IN MICHIGAN IN 1898.

During the year 1898 three outbreaks of mumps, were reported to this office from the following localities: Newberg Township, Cass County, one case; Rome Township, Lenawee County, one case, and from Au Gres Township, Arenac County, from which jurisdiction the health officer reported the disease *epidemic*, but did not state the number of persons attacked by the disease.

ITCH IN MICHIGAN IN 1898.

December 22, 1898, B. F. Johnston, M. D., Health Officer of Isabella Township, Isabella County, wrote to this office stating that itch was prevalent in two of the public schools in his jurisdiction, and asking for advice as to the action he should take in the premises.

In reply to Doctor Johnston's letter, December 23 the secretary wrote:

"In reply to your letter of December 22, relative to the itch being present in the public schools of your township, itch is not considered a 'disease dangerous to public health.' It is a nuisance, however, and I would advise the local board of education to act upon the subject, and that the health board recommend the treatment of the cases by some physician, and that pupils having itch be excluded from the school by the school board."

CANCER IN MICHIGAN IN 1898.

July 21, 1898, a resident of Hesperia Village wrote to the secretary of this Board stating that a person residing in that village who had cancer on the lower lip, drank frequently from a cup used by the general public at a public fountain in the village.

July 23, the secretary wrote to the health officer of the village informing him of the report made to this office and asking his attention to the case which was considered dangerous to the public health.

ERYSIPELAS IN MICHIGAN IN 1898.

During the year ending December 31, 1898, special reports of the presence of erysipelas were made to this office from three localities in Michigan as follows: From Albion, one case; Kalamazoo, two cases; Marquette, one case.

These instances of erysipelas do not represent all erysipelas which occurred in the State in 1898.

Reference to page 63 of this report shows that 12 per cent of all the 5,219 card reports received at this office during the year showed presence of the disease in some localities at various times.

POISONING BY VANILLA EXTRACT.

October 3, 1898, D. J. Erwin, M. D., Health Officer of Lake City Village, Missaukee County, wrote to the secretary of this Board as follows:

"There has been a case of poisoning here which I think was due to the use of impure vanilla extract. There have been three cases and one death. I can't trace it to any other source. They all partook of the vanilla. They were all taken about alike with the same symptoms only one was more severe than the others. I think it is a case which the pure food commissioner should look into."

October 4, 1898, the secretary referred Doctor Erwin's report to Hon. Elliot O. Grosvenor, State Dairy and Food Commissioner, who, later wrote to the secretary as follows:

"From this investigation it seemed perfectly clear that there was nothing injurious in the vanilla extract complained of, as a sample secured by our inspector proved to contain nothing deleterious."

FORMALDEHYDE DISINFECTION.

H. W. Jones, M. D., Health Officer of the Village of Houghton, Houghton County, having stated in reports to this office that he used formaldehyde in disinfecting rooms, clothing, etc., after cases of dangerous communicable diseases, the secretary of this Board wrote to him requesting an explanation of his method of operating the disinfection.

In reply to the secretary's letter, Doctor Jones sent the following report:

"I use a large Eli Lilly formaldehyde generator and follow instructions faithfully as prescribed in their pamphlet and get elegant results, as my reports show, in aborting the spread of all contagious and infectious diseases.

"Only one thing requires care in the generation of formalin and that is to use only *Columbian spirits*, the ordinary *wood alcohol* contains too many impurities and does not generate formalin in full quantity.

"After the disease is over I take all the clothes that are to be worn, out of the house, from underclothes and stockings, shoes, etc., to the outer garment, and place them in a room and thoroughly fumigate them with the vapor. Every one in the house then takes a bath of sublimate sol. and puts on these prepared clothes.

"As soon as they are gone I first fumigate room, and contents, that contained patients and then go all through the house.

"Their pamphlet will give you full directions of amount of spirit used which you can get on application to firm if you have not already received one.*

"This method of fumigating is in my opinion more potent than sulphur, is inodorous, and destroys nothing.

"Reports giving failures are in my opinion due to the use of wood alcohol and improper adjustment of burners. Any further information you may wish will be most cheerfully given."

June 7, 1898, Heneage Gibbes, M. D., Health Officer of Detroit, sent to the secretary of this Board the following description of the method of formaldehyde disinfection practiced in Detroit:

"A bed sheet is taken and hung on a line across the room, the same as laundry hung on a line, the bottom of the sheet is then raised up to permit the forty per cent formaldehyde solution to be sprinkled upon it. As a receptacle for the solution, a bottle, with a rubber stopper having two holes in it, is used. Through one opening a glass tube is passed to the bottom of the bottle, to admit air when the bottle is inverted, and into the other hole a small perforated sprinkler is passed, the same as used on an ordinary sprinkler. The sheet is then sprinkled, care being taken to spread the required quantity about the sheet as much as possible to admit of the greatest evaporation. If very large rooms are to be disinfected it is necessary to have all sheets hung up before sprinkling. The formaldehyde should be sprinkled on each as quickly as possible.

"One hundred and fifty C. C. of the forty per cent solution is sufficient for each 1,000 cubic feet, and will destroy plate cultures of diphtheria bacillus and pus after five hours of exposure."

Disinfection by formaldehyde is fully explained in Teachers' Sanitary Bulletin for December, 1898, a monthly publication issued by the Michigan State Board of Health.

TYROTOXICON POISONING IN MICHIGAN IN 1898.

During the year ending December 31, 1898, there were six instances of well authenticated, or suspected, sickness from tyrotoxon poisoning in five localities in Michigan, reported to the office of the State Board of Health. The reported number of persons poisoned in three of said localities was fifteen. From the other two localities definite statements

[*The pamphlet is in the library of the State Board of Health, and the Lilly apparatus is in the office and has been used by a member of the Board acting as a committee on the subject.—H. B. Baker, Sec.]

of the number of persons poisoned were not made. No deaths resulted from these alleged poisonings, details of which are contained in the following extracts from correspondence of this office.

Ice-cream poisoning in Ontonagon Village, Ontonagon County.—July 23, 1898, W. D. Gates, M. D., Health Officer of Rockland Township, Ontonagon County, on the postal-card report sent to this office reported six cases of poisoning from ice-cream to have occurred in Ontonagon Village.

July 23, 1898, Secretary Baker wrote to Doctor Gates for further particulars in regard to these cases as follows:

"Dear Doctor—Replying to your postal-card report for July 23, I note that you report cases of tyrotoxicon. I shall be glad to know about the outbreak, how many cases, how many deaths, etc. Was a sample of the poisonous cheese examined, if so, by whom? Was the poisoning caused by cheese? If not, by what? Enclosed please find stamped envelope for your reply."

July 30, 1898, Health Officer Gates replied as follows:

"Dear Sir—In reply to yours of the 27th inst., I will say that on the 17th inst. a lady in this town made a quantity of ice-cream in a new freezer which had been thoroughly washed but not scalded before being used. The milk was new, properly kept, and apparently in perfect condition. She ate of the cream and gave to her children and neighbors. In all six persons ate of it. About two hours after eating all were taken very sick with severe abdominal pains, vomiting, and diarrhea. They were all seriously sick for several hours but have made full and uneventful recoveries. No examination of the cream was made. The family are well to do and exceptionally neat and clean housekeepers. Very truly yours,

W. D. GATES."

Tyrotoxicon poisoning in Ula, Alpine Township, Kent County.—September 12, 1898, Jas. A. Birch, Ula, Kent County, reported that several persons were made seriously ill from ice-cream poisoning. "Six of whom seemed to be more sick than the others, vomited blood, cramped more or less and went into a sort of collapsed condition with pulse-rate very high, varying from 130 to 138. There were no deaths, all have recovered. No bacteriological tests were made."

Cheese poisoning in Dorr Township, Allegan County.—September 17, 1898, Doctor Milan Coburn, Health Officer of Dorr Township, Allegan County, wrote a postal to this office relative to two epidemics of cheese poisoning as follows:

"Have had two epidemics of cheese poisoning in this township. One on June 17, from cheese that had been shipped from Kalamazoo (where it had made people sick) back to the factory at Moline in this township, and resold to a peddler, who distributed it between here and Grand Rapids. The peddler was guaranteed by the proprietor of the factory to reimburse him for any loss. The other epidemic was from the factory. What shall we do?"

September 19, 1898, the secretary replied to Doctor Coburn as follows:

"Your postal card of September 17, relative to cheese poisoning, is before me, for which accept my thanks. Relative to the selling of the cheese,—Section 9316 of Howell's Statutes reads: 'If any person shall knowingly sell any kind of diseased, corrupted, or unwholesome provisions, whether for meat or drink, without making the same fully known to the buyer, he shall be punished by imprisonment in the county jail not more than six months, or by fine not exceeding two hundred dollars.'

"The party selling the poisonous cheese should certainly be prosecuted for violation of the above-quoted law. Because, as I understand, he *knew* it was poisonous. I enclose herewith a stamped envelope, and I shall be glad to have a report of the facts concerning the cheese poisoning."

No further report relative to this poisoning was received.

Tyrotoxicon poisoning in Hartford Village, Van Buren County.—September 28, 1898, the following paragraph appeared in the Detroit Evening News relative to a case of cheese poisoning in Hartford Village, Van Buren County.

"Hartford, Mich., Sept. 27.—Herman Unrath's family of six were poisoned by eating cheese, but a physician pulled them through after several hours' hard work."

September 28, 1898, relative to this announcement, the secretary wrote to R. R. Lawrence, M. D., Health Officer of Hartford Village, as follows:

"I trust you will supply this office with as full a report of the outbreak as possible, stating the symptoms of the persons taken sick, the number that have been taken sick and the number of deaths, etc. A stamped envelope is enclosed for your report.

"The selling of unwholesome provisions is in direct violation of Section 9316 of Howell's Statutes, that is where the person selling such provisions is informed of the fact. Thanking you in advance for the report."

October 3, 1898, Doctor Lawrence wrote to this office as follows:

"In reply to yours of recent date asking for a report of the tyrotoxicon poisoning will say: It occurred in the family of Herman Unrath, well-to-do German. The cheese was purchased at a country store on the 22 ult., and was eaten at supper by every member of the family at home. Six were taken ill within a half an hour, while the seventh, Herman, who came after me, escaped the vomiting, but at present writing is not well,—indigestion. They were all attacked in a similar manner, viz.: Severe pain in stomach followed shortly by vomiting and diarrhea. Prostration was the greatest in the case of Grandma, who is about ninety years of age. They were all typical cases of gastro-intestinal irritant. The youngest child, eight years, had considerable fever, 101, which subsided with the other symptoms, and at present writing they have fully recovered save the father above referred to. I gave a specimen of the cheese to our local cheesemaker, who has forwarded a sample to the 'Pure Food Department' for analysis. If there are any other questions that I can answer for you, feel at liberty to address me on the subject."

October 6, 1898, the secretary wrote to Hon. E. O. Grosvenor, State Dairy and Food Commissioner, as follows:

"I am informed by Dr. R. R. Lawrence, health officer of the village, Hartford, Mich., that some person there has sent you a sample of cheese, alleged to have contained poison, for examination.

"I enclose herewith a stamped envelope, and shall be glad to know your findings relative to the cheese. Serious sickness occurred as a result of eating of that cheese."

Replying to the secretary's letter, October 12, 1898, Hon. E. O. Grosvenor wrote:

"The writer is inclined to the belief, looking at your favor of the 6th inst, that some misunderstanding evidently exists as to what are the duties of the State Analyst, who is connected with this Department. We have been advised by the Attorney General that the statute creating the Department and authorizing the employment of the State Analyst, does not contemplate the examination by him of any samples of food products excepting those picked up by our inspectors in the regular course of their work. In addition, this Department is daily in receipt of requests from health officers and private individuals for examination of goods they send in.

"You can readily see that if the practice of taking up this work was followed, our limited force, two chemists, would not be able to do all of the work, to say nothing of our own work, which, in fact, keeps them busy overtime.

"So far as cheese matters are concerned, we have this to say.—cheese is a dairy product, and as such demands attention from this Department. As far as our resources will allow, we have made a practice to keep employed in the Department a man thoroughly conversant along these lines, and who devotes his entire time to this work. We have sent this inspector on a good many trips to investigate matters of the nature you mention, and have considered it our duty to do so; however, our funds will not permit the steady employment of a dairy and cheese inspector, and at present we have no man fitted for this work.

"We are advised that for all samples we take we must be able to vouch for, and we certainly cannot do this when such samples are not taken up by our inspectors. If it is a favor to your Department, to have this particular sample of cheese analyzed, the writer will ask our chemist to do it on his own responsibility; but we cannot undertake to do this kind of work at all times. In order that you might better understand our position, we have taken the liberty of addressing you at this length, and shall be glad to have you say if you desire this one sample analyzed."

In reply to the last quoted letter, October 15, the secretary wrote:

"Accept my thanks for your letter of October 12, relative to my letter of October 6, relative to analysis of cheese sent to you from Hartford, Michigan. I had no idea that your office was so restricted in its work by law.

"Accept my thanks for your offer to have this one sample analyzed. We would be glad to know the results of an examination of it bacteriologically, and with reference to tyrotoxicon, because, as stated in my former letter, serious sickness occurred from eating that cheese. When I get hold of samples of cheese that have caused sickness, I send them to the State Laboratory of Hygiene, Ann Arbor; but this sample did not come to me, it having been sent direct to you from Hartford."

Report of the analysis was not received at this office.

Suspected tyrotoxicon poisoning in Richfield Village.—August 15, 1898, W. S. Beebe, Health Officer of Richfield Village, Kalamazoo County, wrote to the secretary of this Board as follows:

"On the 12th inst. I was called to see George Weethe, a resident of this place who was taken suddenly ill. He seemed to be laboring under an irritant poison of some kind and the first question I asked was concerning his diet on that day. He thought he had eaten nothing to hurt him but inquiry developed that he had eaten with two other men and they had partaken freely of cheese. I pronounced it a case of poisoning and suspicioned the cheese. A little later I saw one of the men who ate dinner with Mr. Weethe and he was sick in the same way but not so bad. Still later the other one of the three turned up sick also.

"The suffering was characterized by vomiting, purging, prostration and pain in the stomach. In one case there were cramps bordering on convulsions. Still later there were reports of others being sick in less degree who had eaten the same cheese. I suspicioned the cheese and send you by express a sample of it. The cheese was made at Richfield, Mich., by a man who has been in the business twenty years and has never been known to turn out a bad cheese. I visited the plant immediately after attending the above cases and looked it over carefully and could not condemn the manufacturer on the ground of carelessness. Everything seemed to be neat and clean as it could be made. The suspected cheese was sold by C—— S—— of this place and is believed to have been made on July 10, 1898. No more of that particular cheese will be sold. It has been laid aside for investigation. I will be glad to have a report from you if the sample is analyzed by the State Chemist."

August 16, the secretary replied to Doctor Beebe's letter as follows:

"Your letter of August 15, relative to cheese poisoning, is before me, for which please accept thanks. The sample of cheese is also received. This is a bad time of the year to get work done at the State Laboratory of Hygiene, because of absence of director and assistants. However, I send the sample to the laboratory this morning; and if a report is made to this office, I will endeavor to let you know the results. I hope the remainder of that cheese will be kept, because it may be very desirable to have it for further investigation. I presume you are right in your idea that the cheese caused the sickness."

No report of analysis has been received at this office.

GLANDERS IN HORSES IN MICHIGAN IN 1898.

During the year ending December 31, 1898, there were reported to this office eleven outbreaks of alleged glanders in horses in Michigan, in the course of which twelve animals were reported infected. Two of the horses were killed, and one died from the disease.

In some of the instances the disease was traced to former cases of the disease in other localities. Alcona, Osceola, Arenac, Berrien and Newaygo Counties and Port Huron in St. Clair County, were each reported as having one case of the disease, but none of the cases were reported as having come from any other locality. The villages of Wayland and Hopkins Station in Allegan County were each reported as having had one case, without any reported spread of the disease. From the village of Lacota, in Van Buren County, two cases were reported, from one of which four other cases were reported to have been infected; but this office was unable to gain further information on the subject. In Lenawee County one case was reported from the village of Cadmus, and one from near Addison, in Somerset Township. The last case was reported as having been contracted from Wheatland Township, Hillsdale County.

ACTINOMYCOSIS (LUMP-JAW) IN MICHIGAN, IN 1898.

During the year ending December 31, 1898, lump-jaw was reported to have been present in five counties in Michigan, as follows: Inland Township, Benzie County; Bronson Township, Branch County; Jonesville, Hillsdale County; Concord, Jackson County, and Elmira, Otsego County, one case having been reported in each locality. The cases were all apparently endemic, and not sufficiently authenticated in the reports to this

Board, to be of sufficient value for publication. One case, however, called forth correspondence which shows the relation between the State Live Stock Commission and the State Board of Health in such cases, and the relation of each Board to outbreaks of diseases among animals in this State.

Suspected lump-jaw in Bronson Village.—Doctors Sanders and Cornell wrote to this office, December 1, 1898, relative to a suspected case of lump-jaw in the village of Bronson, and the sale of the meat from the suspected animal, requesting information, as follows:

"One of our patrons has reason to believe that a farmer has sold him a front quarter of beef—(as he calls it) 'a *tumpy-jawed* critter.'

"The man had such an animal and acted strange when he sold it to him. He also gave the liver to a neighbor and they would not eat it for it was not right. We told him to keep the meat and not use it and we would see what could be done about it."

The letter concluded asking for information and stating that the Dairy and Food Commissioner had been addressed on the subject.

A letter was sent from this office to Doctors Sanders and Cornell, quoting Section 9316, Howell's Statutes, as follows:

"If any person shall knowingly sell any kind of diseased, corrupted, or unwholesome provisions, whether for meat or drink, without making the same fully known to the buyer, he shall be punished by imprisonment in the county jail not more than six months, or by fine not exceeding two hundred dollars."

A copy of the letter of Doctors Sanders and Cornell, asking for information, was sent to Hon. J. J. Woodman, Secretary State Live Stock Sanitary Commission, Paw Paw. In reply, Mr. Woodman wrote as follows, making a concise statement of the relation of the State Live Stock Sanitary Commission and the State Board of Health to each other, and of each to outbreaks of diseases among animals in the State.

"Paw Paw, Mich., December 6, 1898.
"I am inclined to think that actinomycosis is becoming quite prevalent in the State, and that we are likely to have considerable work to do in stamping it out. Hence, it is well to ascertain and fully understand the duty of our respective boards.

"If I understand the law, it is made the duty of our commissioner to 'protect the health of the domestic animals of the State,' and your Board to take charge of all matters concerning the 'health of the people.' In some cases our duties seem to come very near together. Had the case you report been placed in our hands before the animal was slaughtered, we should have governed it, and thus prevented the sale of the animal or its products. In that case we could have prosecuted the man for violating our orders; and you, through the local board of health, could also have prosecuted him for violating the general health laws of the State. As the case now stands, our commission has no jurisdiction; and the city health officer, if in the city of Bronson, or the local board of health, if in the county, has full power to investigate the case and prosecute the man, if the law has been violated. The disease is generally confined to the head and jaws,—that is the external symptom, but we often find it in every part of the body. Hence a mere inspection of the meat, would not justify the selling or disposing of the meat for human food. The question is, did the man sell or dispose of, meat for human food, of an animal known to him to have been diseased at the time of the slaughtering? It is my opinion that the local health officers have full authority to handle the case."

POISONING, OR A FATAL DISEASE, AMONG HOGS, IN CHARLOTTE CITY.

November 16, 1898, A. R. Stealy, Health Officer of Charlotte City, wrote to the Secretary of this Board stating that a peculiar disease had appeared in a herd of hogs which was kept in that city; and that some fifteen hogs had died within three or four days. The health officer further states relative to these hogs:

"The owner had fed them a couple of boxes of bologna sausage,—did not know that it was spoiled, except that he got it from a meat market. Of course this does not come under your department; but you may be able to give us information. We fear trichina, but have not been able to examine a specimen of the flesh yet."

A copy of Dr. Stealy's letter was sent to the State Live Stock Sanitary Commission.

In reply to Dr. Stealy's letter, the secretary of this Board wrote as follows:

"Your letter of November 16, relative to death of hogs, is before me, and I have written the contents of your letter to Hon. J. J. Woodman, member of State Live Stock Commission, Paw Paw, Mich., that commission has to do with diseases dangerous to animals only.

"The bologna sausage should not have been fed to the hogs. As the disease is liable to be dangerous to man as well as animal, your board of health should take immediate action, and if necessary the isolation of the infected hogs as well as all infected things should take place, in order that the public may be guarded against any dangerous communicable disease that the hogs may be infected with. Of course no flesh of that lot of hogs should be permitted to be eaten. You will no doubt hear from Mr. Woodman on the subject. Mr. Woodman represents the Commission for your district.

"I shall be glad to know just what is done for the restriction and prevention, and the nature of the disease, etc. * * * * * My belief is that not only trichina may be spread by feedings hogs on flesh of other hogs or bologna, but also that hog cholera can be spread in this way."

November 22, 1898, Mr. J. J. Woodman of the State Live Stock Sanitary Commission, wrote to this office relative to this subject as follows:

"I am quite sure that the trouble with the hogs at Charlotte is poisoning. The symptoms given do not indicate either cholera or 'trichina.' Both diseases work slower. The bologna sausage did the work without doubt, and after the poisoned, one dies or recovers, there will be no further trouble; but should there be let me know."

No information of further developments in this outbreak have been received at this office.

ALLEGED RABIES (HYDROPHOBIA) IN MICHIGAN, IN 1898.

During the year 1898, information relative to six alleged outbreaks of rabies was received at the office of the State Board of Health.

The following are extracts of correspondence relative to the above-mentioned outbreaks:

Alleged rabies in Oxford, Oakland County.—May 9, 1898, a postal card was received at this office from W. L. Cole, M. D., Health Officer of Oxford Village saying:

"Three weeks ago a dog was seen on the streets of Oxford; it bit several dogs and chickens, also a cow. Three dogs died of hydrophobia, and a well marked case of hydrophobia developed in the cow. The cow and dogs were shot. The village board held a meeting and authorized the marshal to kill all unmuzzled dogs seen on the streets after 9 a. m., of the 10th of May."

May 11, 1898, the secretary of this Board wrote to Doctor Cole, commending the prompt action of the Oxford health authorities in restricting the spread of the disease, and continuing said:

"I can see that possibly the board's action might be questioned where they kill or order killed animals that have been bitten but have not as yet developed the disease. In order to be on the safe side, and in the case of valuable animals that have been bitten, I would suggest that such animals be isolated until the period of incubation has passed."

Alleged rabies in Fremont Township Saginaw County.—May 23, 1898, a letter was received at this office from Orma Bradford, Health Officer of Fremont Township, which read as follows:

"We have a case of mad dog which has bitten a number of cows and the board of health wishes you to inform them what shall be done in regard to using milk or butter, made from milk of cows in the yard with those that were bitten."

May 24, 1898, Secretary Baker of this Board replied to Mr. Bradford's letter as follows:

"Rabies, or hydrophobia, is a dangerous disease that may be spread to human beings and should be promptly stamped out. The law requires that cases of dangerous diseases in animals should be reported to the State Live Stock Commission, Stanton, Michigan, but

in this case I have written him giving the substance of your letter. By mail I send you a publication of this office bearing upon rabies, and in which I have marked portions which may be of interest to you. All animals suffering with the disease or those having been bitten, should be carefully isolated until incubation period has passed.

"If your board of health has not already done so, it should frame under Section 1636, Howell's Statutes, and publish under Section 1639, Howell's Statutes, rules and regulations which would enable the health officer to take prompt and active measures for the restriction of such disease, without having to call the local board of health together. Herewith I send you a copy of our leaflet No. 120, in which I have marked parts bearing upon the subject."

May 28, 1898, a letter was received from Mr. Bradford, saying that rabies had developed in three more cows, that they had been killed and burned. And that the local board of health passed an ordinance to kill all dogs not muzzled or tied up.

Alleged rabies in Northfield Township, Washtenaw County.—May 1898, Dr. E. Smith, Health Officer of Northfield Township, wrote to the Secretary saying that a strange dog came to their place, that it bit a cow belonging to them; shortly afterwards they discovered the cow showed symptoms of rabies. Two cows belonging to Mr. Harron were bitten by the same dog.

May 28, 1898, Doctor Baker wrote to Doctor Smith as follows:

"Rabies is a disease dangerous to man as well as animals and should be promptly restricted by the local board of health, and by you as health officer. Infected animals should be isolated until all danger is past. I send you by mail a copy of a publication of this office in which I have marked parts bearing upon the subject. Relative to the cow suffering with the disease, she should be isolated until all danger is past. If the animal has rabies she will probably die within eight or ten days. To kill the animal without knowing she has rabies, might be an unnecessary sacrifice of valuable property. In case of infected animals like dogs, killing might be the best way, providing that no human person had been bitten.

"The law provides that outbreaks of dangerous diseases in animals should be reported immediately to the President of the State Live Stock Commission, Hon. H. H. Hinds, Stanton, Michigan. However, in this instance I have written Mr. Hinds relative to the outbreak. It is possible that Mr. Hinds or some member of his Commission will investigate.

"I hope you will endeavor to find out the whereabouts of the dog, that this office may take action to follow up the infected animal, and give notice to the health officers of the jurisdictions into which he went."

May 30, 1898, the following letter was received from Doctor Smith:

"As to the outbreak of rabies—the dog was killed by one Bower, on the same day that Fultz and Harron's cattle were bitten. Bower lives on an unfrequented road and heard nothing and suspected nothing until yesterday, when he heard of his neighbor's experience. He then told what he knew concerning the affair—said that a large white dog came to their house during the afternoon, but as hunters frequent these marshes and lakes, thought little of it until he attacked and bit his dog, then he shot him. He has his own dog securely confined awaiting developments. Yesterday Fultz came to me and represented that the cow was failing very fast, that the veterinary attendant assured him that there was not the slightest chance for her recovery. We gave him an order to kill cow and dispose of carcass in a proper manner. The Harron brothers live a short distance from Fultz—the dog was first discovered in the cow-yard in the midst of a valuable drove of Jersey cows, two are known to be bitten, but William Harron told me yesterday that he presumed that many more might be included. They are somewhat puzzled as what should be done with the milk. I advised destroying milk produced by the two that were bitten, to have milk from the rest of the drove carefully examined by experts. Have sent a notice to the nearest news office that every animal infected should be closely watched."

June 2, 1898, the secretary wrote Doctor Smith as follows:

"I agree with you that it is not judicious to use milk of cows bitten by a rabid animal."

Suspected rabies in Wheatfield Township, Ingham County.—October 24, 1898, the following communication from Albert D. Pollok, Health Officer of Wheatfield Township, was received at this office.

"A strange dog passed through the east part of this township about thirty days ago, acting in a very peculiar manner. Some people thought it was mad as it was known to have bitten several dogs. Two hogs have died of what was supposed to be hydrophobia by some people and by others to be a disease of the brain. The supervisor notified the owners of the dogs living in the vicinity, either to kill their dogs or tie them up, but so far no notice has been paid to his orders. What course should be pursued?"

October 25, 1898, Secretary Baker replied to Mr. Pollok's letter as follows:

"Please accept thanks for your letter giving notice of a strange dog which probably had rabies. I have notified Hon. J. H. Brown, member State Live Stock Commission, Climax, Mich., and have suggested to him *the subject should receive immediate attention*. By this mail I send you two pamphlets carefully marked to indicate to you what, in my judgment, you and your local board of health should do. I think you should construe act 137, laws of 1893, to apply to infected *animals* as well as to infected persons, and you should order the complete isolation of every infected animal and animal likely to be infected so long as there is danger of their spreading the disease.

"I think your local board of health should meet at once and *frame and publish* regulations, in accordance with the laws which I have marked in the pamphlet sent to you today. I think the local board of health should appoint the supervisor or some *person* to see that the regulations are enforced, and to promptly place in the hands of the prosecuting attorney the facts relative to every violation of the laws."

Suspected rabies at Williamston, Ingham County.—November 15, 1898, M. Hanlon, County School Commissioner of Ingham County, called at this office with Mr. Smith of the Department of Public Instruction, and reported that because a boy was bitten by a dog supposed to be mad, there was great excitement among the people of the district, and boy was threatened with being kept away from school, by the people. The boy's name is Kendall, aged about fourteen years, bitten about September 24. Probably there was no cauterization. Not known where bitten nor what has become of the other dogs bitten. Doctor Baker said that he thought that the period of greatest danger was passed.

Rabies in Hadley Township, Lapeer County.—December 25, 1898, the Lansing Tribune contained the following article:

"That for two weeks mad dogs had terrorized the farmers of Hadley Township. One dog was bitten, went mad and was killed. Several hogs were bitten, and some of them were killed, after showing symptoms of hydrophobia. Several cows were bitten and have been killed. One little boy had a narrow escape from being bitten by the mad dogs. Two men were attacked by the dogs but managed to kill them before any damage was done."

December 15, 1898, a letter was sent from this office to Dr. Peter Stewart, Health Officer of Hadley Township, asking for further information relative to above report.

December 16, 1898, a letter was received from Doctor Stewart which read as follows:

"A dog came to Fred Miller's, did not act much out of the way except having a propensity to make the stock stand around. It got into a fight with Miller's dog, bit a cow and several pigs; the cow died. I saw the cow the day before it died, it acted very strangely. Mr. Miller said that previous to tying the cow up it would dive at the chickens or any other object, trying to hook them. Saliva came from its mouth at first. Some time later we heard that a dog (answering the same description as one that came to Mr. Miller's), bit a dog belonging to John S. Sweeney. The dog was killed. A hog belonging to Perry Himes acted strangely, so it was killed. Kindly advise us what you think best to do in the case. I give you the facts, as near as I can without going to see all of the parties personally, and of course it is a question, whether dog was mad or not. The newspaper article is colored a little strong, as the dog did not bite Miller's boy."

December 20, 1898, the secretary wrote to Doctor Stewart as follows:

"The contents of your letter have been written to Hon. J. H. Brown, member State Live Stock Commission, Climax, Michigan. That Commission has to do with diseases in animals only.

"I have good reasons to believe that the animals had rabies (hydrophobia), and all precautions necessary for the restriction of the disease should be taken by the health authorities, as the disease is dangerous to man as well as animals. By the mail I send you a pamphlet bearing upon the subject which I trust you will study. I shall hope to hear from you later that the disease has not been permitted to spread."

January 6, 1899, Doctor Baker again wrote to Doctor Stewart as follows:

"The following is taken from the Detroit Journal of January 5, 1899: 'Another mad dog has made its appearance in the vicinity of Hadley. Many dogs were bitten and have been killed. The maddened brute also created havoc among cattle, droves of hogs and flocks of sheep. I trust that you and your board will be able to take such vigorous action that this dangerous disease will be stamped out.'"

January 8, 1899, Doctor Stewart replied to the secretary's letter as follows:

"In regard to hydrophobia in our township, I had already made investigation of this outbreak, and had reported same to Secretary of Live Stock Commission, J. H. Brown, Battle Creek. The township board of health held a meeting January, 1899, and passed the following resolution:—'Resolved, That all dogs of the township shall be muzzled or tied up after January 9, for a period of sixty days, and any person shall be authorized to kill any dog found running at large unless properly muzzled. All dogs killed shall be reported to the township clerk.' The above was printed as a notice."

TRICHINOSIS IN MICHIGAN, IN 1898.

During the year 1898, one outbreak of trichinosis was reported to this office as having occurred at Clarenceville, Livonia Township, Wayne County. In this outbreak there were eight cases and four deaths from this disease. The cases were all in one family. The patients were sent to Grace Hospital, Detroit. Samples of the pork from the eating of which the disease was believed to have arisen, and muscles from the body of one of the children that died were sent to Doctor Salmon, Chief of the Bureau of Animal Industry, Washington, and to Dr. Victor C. Vaughan, Director of the State Laboratory of Hygiene, Ann Arbor for examination.

The results of the investigation made by Doctors Salmon and Vaughan were as follows:

"Henry B. Baker, Secretary State Board of Health:

"Package received. All samples very heavily infected with trichinæ.

"D. E. Salmon, Chief of Bureau."

"Henry B. Baker, M. D., Secretary State Board of Health, Lansing, Michigan:

"Dear Doctor—I have samples of the sausage from the cases at Clarenceville, also a small piece of muscle from the boy who died last. Doctor Burgess of Northville brought me some of the sausage about two weeks ago. In the first piece examined, I was unable to find trichinæ, but in other pieces found them in great numbers. Doctor McClymonds has obtained from the sausage two interesting bacteria. One of these belongs to the colon group and is quite virulent to the lower animals. The other bears a striking resemblance to the bacillus of malignant cedema, or, as it is sometimes called, gaseous cedema. However, its identity with this germ has not as yet been positively determined. On the last day of January I went to Detroit, and through the kindness of Doctor Cooley, in charge of the cases, I was permitted to draw a little of the subcutaneous fluid with a sterilized syringe, from one of them. In this, as well as in the sausage, the germ resembling that of malignant cedema has been found. It is possible that the irritation of the intestines caused by the trichinæ enabled this germ to find its way into the tissues. Whether it had anything to do with the causation of the symptoms, I am not prepared to say. The condition of the meat and the presence of trichinæ in the muscles of the dead boy show that the cases were plainly those of trichinosis. However, I have thought that it might be of interest to work up the bacteria found in the meat and will make you a report upon these more in detail later.

"Respectfully,

"V. C. VAUGHAN."

HOG-CHOLERA IN MICHIGAN, IN 1898.

During the year 1898, hog-cholera, or what was suspected of being hog-cholera, was reported present in eight localities in Michigan, resulting in a large number of deaths. The infected localities were as follows: Parma, Henrietta and Rives Townships, Jackson County; Wakeshma Township, Kalamazoo County; Tallmadge Township, Ottawa County; Maple Valley Township, Sanilac County; Brownstown and Springwells Townships, Wayne County.

The following extracts from the correspondence of this office give details relative to the various reported outbreaks of the disease:

Alleged hog-cholera in Tallmadge Township, Ottawa County.—Under date of January 12, 1898, the clerk of Tallmadge Township, Ottawa

County, informed the State Board of Health that Mr. G. Schaap of that township had "already lost three hogs by a peculiar disease and has several others sick;" he also sent a memorandum by Mr. Schaap showing that the symptoms of the disease were:

"(1) Refuse eating; (2) lay down, breathe hard and groan; (3) no moving of the bowels; (4) weakness of the backbone and hind legs, so that they cannot walk; (5) uneasy, move frequently, bad smell about them, and, finally, they die. People here want to call it cholera, but I do not believe it yet. I would like to have more and better authority for it."

January 14, the secretary wrote to Hon. H. H. Hinds, President of the State Live Stock Sanitary Commission, giving him all the information which had been received.

On the same day a letter was sent to the health officer of the township giving him the reported facts in the case and stating that:

"The disease with which these animals were infected seems to be very contagious and perhaps dangerous to man as well as to animals. The local board of health should protect the lives and health of its citizens and it is your duty to act under act 137, Public Acts of 1883, for the protection of the people until the State Live Stock Sanitary Commission, which has charge of this matter, relieves you."

No further information relative to this outbreak has been received.

Alleged hog-cholera in Parma Township, Jackson County.—January 18, the health officer of Parma Village advised this office that it was reported that hog-cholera existed in the herd of Mr. Gilbert Hogel of Parma Township. The secretary wrote to the health officer of the township January 20, and at the same time to the President of the State Live Stock Sanitary Commission in regard to the outbreak. January 29, the secretary received a report from the township clerk saying:

"I have just seen him (Mr. Hogel). He says that he has lost no hogs in the last five weeks, but did lose about seventeen, mostly pigs. Hogs are now doing well. Does not think it was cholera."

Alleged hog-cholera in Henrietta and Rives Townships, Jackson County.—July 2, a communication was sent to J. J. Woodman, Paw Paw, Michigan, member of the State Live Stock Sanitary Commission, from this office, which was as follows:

"J. C. Harter, Sanitary Inspector, Jackson, Michigan, writes:

"There is hog-cholera in the vicinity, several hogs dying. Meat from hogs in the herd has been sold in the market but as far as we know the hogs sold were sound, although cholera was existing in the herd when they were killed. I have reported the existence of the disease to the State Veterinary Surgeon."

July 5, Mr. Harter wrote to this office stating that the disease had been located as being in the herd of Mr. Horace Jump of Henrietta Township, Jackson County, of which several hogs had died of the disease and that the owner of the herd admitted the existence of the disease. July 6, the health officer of the township was addressed on the subject and suggestions made for the guidance of the local board of health until the State Live Stock Sanitary Commission should have acted in the case. July 9, a letter was received from this officer corroborative of our previous information, and stating in addition as follows:

"As to what the disease is of course I know nothing about it as there has been no expert to see the case, but some of those who claim to be acquainted with hog-cholera say it is not,—but the report is now going that it is hog-cholera."

"Mr. Jump some time ago sold ten dressed hogs in the Jackson market when a complaint was made to the extent that the market held the hogs for three days when the food commission ordered them to be put on the market again."

Mr. Harter in his letter to this office had also stated that he thought the disease had found victims in Rives Township of the same county; but in reply to our inquiry sent to the health officer of that township, we learned

that two herds had been infected with a disease which was supposed to have been cholera, but that at the time he wrote no animals were sick.

July 11, a letter was written to the secretary by Mr. Woodman saying that, following our letter to him, he had written to Mr. Jump for further information and that he was just in receipt of his reply stating the condition of his herd to be about as we described it. Continuing Mr. Woodman wrote:

"I will go there at once, and investigate. The only practical way to deal with it is to quarantine, and to enforce sanitary measures to prevent its spreading.

"I do not think that any serious results will come from the dressed hogs sold on the market. If they were diseased or had cholera, decay of the meat would have commenced within 'three days,' I am sure. I have known of an instance where a man dressed several hogs apparently well, from a herd having cholera, and packed them for his own use, and the meat rotted in a very few days, and the stench was profuse. So I infer that the meat of hogs having cholera will quickly decay."

No further information as to the developments in this outbreak was received at this office.

Alleged hog-cholera in Wakeshma Township, Kalamazoo County.—September 2, 1898, Eugene Barney, a resident of Wakeshma Township, Kalamazoo County, wrote to the president of this Board stating that a fatal disease had appeared among the hogs in that township and asking for information and advice in regard to the treatment of the disease. The president referred Mr. Barney's letter to the secretary of the Board who referred the matter to the State Live Stock Sanitary Commission and instructed Mr. Barney how to proceed in the case until it was taken charge of by the Commission.

Alleged hog cholera in Brownstown Township, Wayne County.—September 19, Mr. George A. Wells of Flat Rock notified this office that a peculiar disease had appeared in his herd, of which ten were already dead. A copy of his letter was transmitted to the Live Stock Sanitary Commission, and he was directed to report to the local board of health, that they might "take prompt measures for the restriction of the disease."

Alleged hog-cholera in Springwells Township, Wayne County.—During October communications were received at this office from the health officers of Springwells Township and Detroit City, both of whom asserted that hog-cholera existed among the hogs in the townships adjacent to Detroit. In reply, this office stated that those jurisdictions should regulate the matter and the subject was duly brought to the attention of the State Live Stock Sanitary Commission.

Alleged hog cholera in Maple Valley Township, Sanilac County.—December 22, a communication was sent to this office by the clerk of Maple Valley Township, Sanilac County, saying that a very fatal disease had appeared in a herd within his jurisdiction, and asking what action was proper or allowable under the circumstances. This case like the former, was referred to the State Live Stock Sanitary Commission, and this office is not advised as to the developments in the case.

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO
HAVE BEEN CAUSED BY THE USE OF KEROSENE,
IN MICHIGAN, DURING THE YEAR END-
ING DECEMBER 31, 1898.

Continuing a practice pursued in previous years, the office of the Secretary of the State Board of Health has, during the year 1898, sought to obtain information relative to each casualty, alleged to have been caused by the use of kerosene, which came to the notice of said office.

The principal sources from which this office obtains facts in regard to such casualties as above mentioned, are four, viz.: From reports by the fire marshal of Detroit, State inspectors and deputy inspectors of illuminating oils, local health officers, and from newspaper reports. Relative to the last of these sources of information it should be stated that the secretary of this Board does not accept as necessarily authentic, newspaper reports of casualties from the use of kerosene. When such reports come to his knowledge, he applies to the proper officials of the localities in which they are said to have occurred, for confirmation or contradiction of the reports, and for any information which these officials may be able to give in connection with the alleged casualties. A copy of the form of letter used on such occasions, is given in the annual report of this Board for the year 1892, page 334. The data collected from these sources show that during the year 1898, information was received at this office of the occurrence of sixty-one casualties consequent on the use of kerosene in Michigan. The casualties were reported to have occurred in nine localities, causing loss of one life, and damage of property to the amount of \$27,918.

This reported damage does not include all the actual pecuniary loss occasioned by the above-mentioned casualties, because in some instances where houses, barns and other property were destroyed the loss was not reported.

TABLE 1.—*Casualties in Michigan during the year 1898, believed to have been consequent on the use of kerosene, information of which was received at the office of the Secretary of the State Board of Health. In this year the legal test was a flash test of 120° Fah., in a Foster automatic tester.**

	Number of casualties.	Number of localities.	Pecuniary losses, dollars.	Lives lost.	Persons injured (not fatally).
In Detroit.....	53	1	25,868	0	0
In State (outside Detroit)	8	8	2,050	1	0
Totals.....	61	9	27,918	1	0

*In 1893, the legal test of kerosene, for illuminating purposes, was, by legislative enactment (Section 2, act 94, public acts of 1893) made as follows: "It shall be the duty of the inspector and his deputies to provide themselves at their own expense with the necessary instruments and apparatus for testing the quality of said illuminating oils, and when called upon for that purpose to promptly inspect all oils hereinbefore mentioned, and to reject

for illuminating purposes all oils which will emit a combustible vapor at a temperature of one hundred and twenty degrees of Fahrenheit's thermometer: *Provided*, The quantity of oil used in the flash test shall not be less than half pint. The oil tester adopted shall be the Foster automatic tester cup, with the lighted wick placed inside the tube, and under the thimble which shall be used by the inspector and his deputies." Act 94 became operative July 1, 1893.

CASUALTIES FROM THE USE OF KEROSENE IN 1893, COMPARED WITH PREVIOUS YEARS.

TABLE 2.—*Exhibiting the number of casualties believed to have been consequent on the use of kerosene in Michigan (including the city of Detroit), information of which was received at the office of the Secretary of the State Board of Health in each of the ten years, 1889-1898. The legal test of kerosene in each year is explained in the *foot-note to this table.*

Year.	Number of casualties.	Amount of damage done. dollars.	Number of lives lost.	Number of casualties caused by lamp explosions.	Number of casualties caused by stove explosions.
1889	53	74,049	8	16	2
1890	55	18,282	2	22	6
First six months of 1891.....	430	10,778	2	19	2
Last six months of 1891.....	4118	42,050	9	74	6
Total for the year 1891.....	148	52,828	11	93	8
1892	134	66,106	7	75	17
First six months of 1893.....	43	25,958	0	21	10
Last six months of 1893.....	40	23,542	2	22	5
Total for the year 1893.....	83	49,500	2	43	15
1894	64	20,374	9	29	1
1895	44	28,121	1	18	0
1896	59	17,756	3	33	1
1897	62	13,878	5	31	0
1898	61	27,918	1	31	1

*In the years 1889, 1890, and the first half of 1891, the legal test was a flash test at 120 degrees Fah., in a closed tester; and in the last half of 1891, in 1892 and the first half of 1893, it was a burning test at 120 degrees Fah., in an open tester, which, because it varies greatly, is equal to a flash test of from 95 to 110 degrees Fah., probably averages about equal to a flash test of 100 degrees Fah., in a closed tester, like the one approved by the State Board of Health. The last half of 1893, and in 1894, 1895 and 1896 the legal test was a flash test at 120° Fah., in the Foster automatic tester, which has not been approved by the State Board of Health.

†The total reported damage (\$74,049) for 1889 includes \$40,000 damage caused by a single fire at 678 Jefferson avenue, Detroit. The fire was caused by a careless manipulation of an oil heater used for heating a conservatory, and "was not the result of the grade of the oil used."

‡Included in these numbers are data relative to twenty-seven reported casualties in 1891, of which the exact dates of occurrence were not reported. In order to make an equitable distribution of these between the first and last halves of the year a proportionate division of them is made, based on the data contained in Table 2 of this article, thus: Table 2 shows that *exclusive* of the above-mentioned twenty-seven casualties, there were reported 121 casualties in the State, in 1891; that twenty-four (about 20 per cent) of these occurred in the first half of the year, and ninety-seven (about 80 per cent) occurred in the last half of the year. The twenty-seven casualties, the dates of which are not given, are divided between the first and last halves of the year in the same proportion, that is 20 per cent of them are added to the first half, and 80 per cent to the last half of the year.

TABLE 3.—*Exhibiting the number of casualties believed to have been consequent on the use of kerosene in Detroit during each of the years 1889-1898. (Reported by the fire marshal of Detroit to the office of the State Board of Health.) The legal test of kerosene in each year is explained in the *foot-note to Table 2 of this article.*

Year.	Number of casualties.	Amount of damage done, dollars.	Number of lives lost.	Number of casualties caused by lamp explosions.	Number of casualties caused by stove explosions.
1889	35	*65,250	3	14	2
1890	44	18,282	0	15	6
First six months of 1891	14	2,878	0	9	2
Last six months of 1891	41	9,760	2	26	5
Total for year 1891	55	12,638	2	35	7
1892	79	39,306	2	37	13
First six months of 1893	37	20,958	0	19	10
Last six months of 1893	34	18,536	0	19	5
Total for year 1893	71	39,494	0	38	15
1894	55	18,844	3	28	1
1895	42	27,471	0	17	0
1896	47	17,266	0	26	0
1897	43	11,678	2	20	0
1898	53	25,868	0	30	0

*The total reported damage for 1889 includes \$40,000 damage caused by a single fire at 678 Jefferson avenue. The fire was caused by careless manipulation of an oil heater used for heating a conservatory, and "was not the result of the grade of the oil used."

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED BY THE USE OF GASOLINE IN MICHIGAN IN 1898.

In 1898, as in former years, an effort was made, at the office of the Secretary of the State Board of Health, to collect facts respecting every casualty attributed to the use of gasoline, in Michigan, which came to notice. During the year there were received at the office of the Secretary of the Board reports of ninety-three casualties in twenty-six different parts of the State alleged to have been caused by gasoline, with attendant losses of life and property, and personal injury as follows: Eight persons fatally, and eleven persons more or less severely injured; damage to property to the amount of \$12,698.

TABLE 1.—*Casualties in Michigan during the year 1898, believed to have been consequent on the use of gasoline, information of which was received at the office of the Secretary of the State Board of Health.*

	Number of casualties.	Number of localities.	Pecuniary losses, dollars.	Lives lost.	Persons injured (not fatally).
In Detroit.....	62	1	12,536	1	0
In State (outside Detroit)	31	25	162	7	11
Totals in Michigan.....	93	26	12,698	8	11

Of the sixty-two reported casualties from the use of gasoline in Detroit during the year 1898, one was attributed to a stove explosion, forty-seven were attributed to leaking or overflowing stoves, and fourteen to carelessness in handling gasoline.

The source of danger in the use of gasoline.—The special source of danger in the use of gasoline is its ready vaporization at low temperatures. When exposed to the air, gasoline evaporates quickly, its vapor mixes with the air, and therewith forms an explosive mixture which readily ignites when it comes in contact with a flame or other sufficient cause. This property of gasoline renders it more dangerous than is gunpowder. Some of the casualties reported were undoubtedly the result of ignorance, or disregard, of these facts.

ALLEGED NUISANCES IN MICHIGAN IN 1898.

During the year 1898, communications relative to forty-seven alleged nuisances, in Michigan, were received at the office of the State Board of Health.

The causes to which the alleged nuisances mentioned in these communications were attributed, may be classified as follows:

Contaminated ice, 1; contaminated water tank and well, 2; pig pens, cow stables, etc., 7; privy-vaults, cesspools, etc., 8; dead animals, 3; night-soil and sewage contamination of land, 2; refuse from dye-works, 1; waste dumped into a stream, 1; drainage and sewer pipes, 7; slaughter-houses, 3; dove-cote, 1; mill ponds, 2; stagnant ponds, ditches, etc., 5; lake and river flooding, 3; unsanitary condition of villages and premises, 3.

Whenever complaint of an alleged nuisance is received at this office, the president of the local board of health whose duty it is to act, is usually informed of the nature of the nuisance, and is requested to investigate the same. At the same time sections of law, and pamphlet publications of this Board, pertaining to nuisances and to the duties of local boards of health relative thereto, are sent to him, and also to the person making complaint. Two regular forms of letters are used for this purpose, copies of which are here given. The first is sent to the person making complaint of the nuisance, the other is sent to the president of the board of health of the locality where the nuisance is reported to exist.

STATE BOARD OF HEALTH, MICHIGAN.
OFFICE OF THE SECRETARY,
Lansing,

Section 1640, Howell's Statutes, requires the local board of health to examine into all nuisances, sources of filth, and causes of sickness which may, in their opinion, be injurious to the health of the inhabitants, and destroy, remove, or prevent the same as the case may require.

Section 7965, Howell's Statutes, gives the circuit court *equity* jurisdiction in all matters concerning nuisances where there is not a *plain, adequate* and *complete* remedy at law; and authorizes the court to grant injunctions to stay or prevent nuisances. If the court is not in session, application should be made to the circuit judge.

If the local board of health refuses or neglects to make the proper complaint for the abatement of a nuisance injurious to health, any person injured or annoyed thereby may make complaint and prosecute a suit for the abatement of the nuisance as a public nuisance, or for damages by reason of the nuisance as a private nuisance, and for the abatement of the same.

Herewith I send you our pamphlet, "Work of Health Officers and Local Boards of Health in Michigan," on pages 10 and 11 of which are paragraphs bearing on the subject of nuisances, and I send you also some other pamphlet publications of this office bearing on the same subject.

I have not asked the attention of the president of the local board of health to this subject. If this office can be of any further service to you in this case, it will give me pleasure.

Herewith I enclose a stamped envelope, and after reasonable time I shall be glad to learn what is done to abate the alleged nuisance, and with what result.

Very respectfully,

Secretary.

STATE BOARD OF HEALTH, MICHIGAN.
OFFICE OF THE SECRETARY,
Lansing,

President of the Board of Health:

Section 1640, Howell's Statutes, requires the local board of health to examine into all nuisances, sources of filth, and causes of sickness that may, in their opinion, be injurious to the health of the inhabitants, and destroy, remove, or prevent the same as the case may require.

Section 7965, Howell's Statutes, gives the circuit court *equity* jurisdiction in all matters concerning nuisances where there is not a *plain, adequate, and complete* remedy at law; and authorizes the court to grant injunctions to stay or prevent nuisances. If the court is not in session, application should be made to the circuit judge.

Herewith I send you our pamphlet, "Work of Health Officers and Local Boards of Health in Michigan," on pages 9 and 10 of which are paragraphs bearing on the subject of nuisances, and some other pamphlet publications of this office bearing on the same subject.

I shall be glad to be informed whether or not, on examination, this alleged nuisance proves to be a nuisance, and, if it is, what measures are taken for its removal or abatement, and with what result. For this purpose a stamped envelope is herewith enclosed.

Very respectfully,

Secretary.

In articles on alleged nuisances, published in previous annual reports of this Board, attention was called to the fact that a large proportion of the communications received at this office in regard to alleged nuisances came from local health officers and other township, city and village officials, asking for information relative to points of law concerning nuisances, or requesting advice as to their duties, or to the proper legal procedure necessary to effect the prevention or abatement of nuisances. The correspondence of 1898, shows a desire on the part of the local health officials for advice and coöperation of this Board, which has been freely and cheerfully given, and it is believed, with beneficial results to the public health.

The State Board of Health has no authority to enforce or order the abatement of a nuisance. Its powers in this respect are advisory. And while the Board is willing to render such advice as it may be able to give on any subject, it is often the case in regard to nuisances that prosecuting attorneys, or other lawyers, on the ground and acquainted with the facts, are in better position to give legal advice than is the State Board of Health. The State Board of Health is always glad to learn of the efforts of local boards to abate nuisances, and what success attends those efforts; and solicits correspondence upon this subject. It cannot, however, undertake to do for local boards that which the law has so well provided for their doing for themselves. In showing them how they can help themselves it really does more for them than to do their work; for when the local board has mastered the situation and removed a nuisance, it has secured a vantage ground which a distant authority could not so well secure and hold.

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ERRATA.

Page 17.—In the heading to Exhibit 13 the figures at the beginning of the third line "1898," should read "1897."

Page 40.—In the explanatory text under Table X, the figures at the beginning of the third line, "18 8," should read "1898."

Page 110.—In the explanatory text to Table 3 the last sentence on the page, beginning "There were eighty-eight more beginnings than endings," should begin, "There were twenty-one less beginnings than endings."

Page 135.—In the last line of Table 7, under deaths, in column 1, the average, "19," should read ".19."

Page 181.—The italicized sub-head, "Ages of greatest prevalence of mortality from whooping-cough" should read, "Ages of greatest prevalence of and mortality from whooping-cough."

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